

## **4.0 FIELD SAMPLING LOGS**

### **4.1 FIELD LOG BOOK**

The field log book will be a bound document containing individual field and sample logs. Information recorded will include:

- i) project number;
- ii) sample matrix;
- iii) name of sampler;
- iv) sample source;
- v) time and date;
- vi) pertinent data (e.g., depth);
- vii) analysis to be conducted;
- viii) sampling method;
- ix) appearance of each sample (i.e., color, evidence of soil staining);
- x) preservation added, if any;
- xi) number of sample bottles collected; and
- xii) pertinent weather data.

Each field log book page will be signed by the sampler.

### **4.2 GEOLOGIC LOGS**

Samples will be logged in accordance with the Unified Soil Classification System (USCS). The logs will be kept on standard log sheets. A copy of the USCS and typical log sheets are contained in Attachment B-1.

## 5.0 DECONTAMINATION OF EQUIPMENT

The analytical sampling equipment decontamination procedures will be as follows:

- i) non-phosphate detergent wash;
- ii) distilled water rinse;
- iii) isopropanol rinse;
- iv) air dry; and
- v) distilled water rinse.

Non-dedicated equipment used for collection of soil or sediment samples for metals analysis will also be rinsed with nitric acid (10 percent).

When practicable, sampling equipment will be wrapped in a material that will prevent it from becoming contaminated. Field decontamination wastes will be containerized and disposed of in accordance with appropriate regulations.

## 6.0 WASTE MATERIAL HANDLING

Solid wastes (i.e., tyvek coveralls, gloves) will be containerized and disposed of in accordance with appropriate regulations.

Decontamination water will be containerized and disposed of in accordance with appropriate regulations.

## 7.0 FIELD SURVEY

All surveying will be performed by a qualified, licensed surveyor. Locations and elevations will be based upon existing grid coordinate systems and established vertical datum.

APPENDIX B

FIGURES

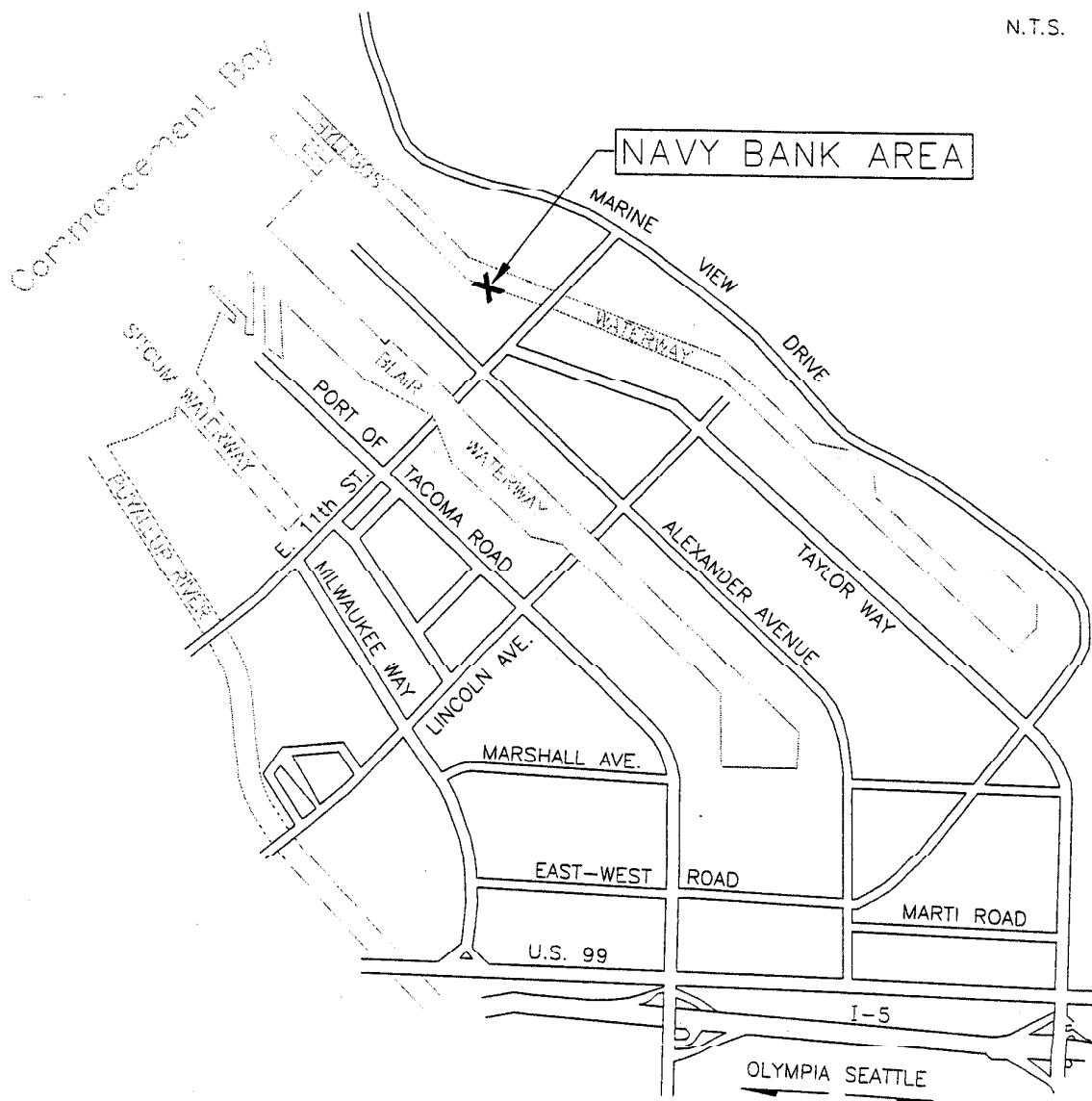
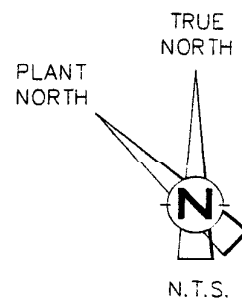


figure B1.1  
LOCATION MAP  
NAVY BANK AREA CHARACTERIZATION  
*Port of Tacoma/Occidental Chemical Corporation*

**CRA**

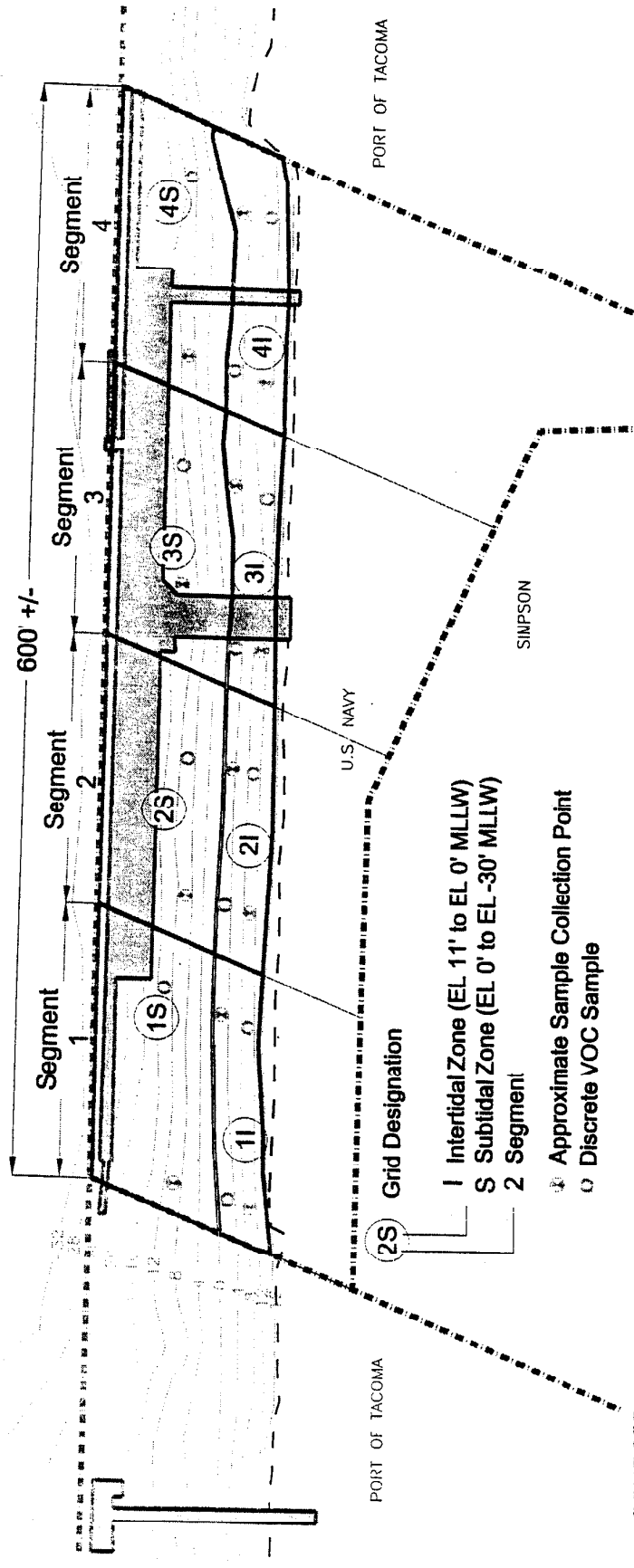
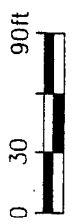


figure B1.2  
SAMPLE GRID  
NAVY BANK AREA CHARACTERIZATION  
*Port of Tacoma/Occidental Chemical Corporation*

**SOURCES:**  
ANCHOR ENVIRONMENTAL, L.L.C.  
GeoEngineers

**NOTE:**  
THE ACTUAL LOCATIONS OF SAMPLE COLLECTION POINTS WILL BE PRESENTED IN THE CHARACTERIZATION REPORT.



**CRA**

SHIPPED TO (Laboratory Name):

REFERENCE NUMBER:

Niagara Falls, NY 14304 (716)297-6150

SAMPLER'S  
SIGNATURE: \_\_\_\_\_  
PRINTED NAME: \_\_\_\_\_

PARAMETERS

No. OF  
CONTAINERS

REMARKS

SEQ. No.

DATE

TIME

SAMPLE No.

SAMPLE TYPE

TOTAL NUMBER OF CONTAINERS

HEALTH/CHEMICAL HAZARDS

RELINQUISHED BY:

①

DATE:

TIME:

RECEIVED BY:

②

DATE:

TIME:

RELINQUISHED BY:

②

DATE:

TIME:

RELINQUISHED BY:

③

DATE:

TIME:

RECEIVED BY:

④

DATE:

TIME:

METHOD OF SHIPMENT:

WAY BILL No.

White

Yellow

Pink

Goldenrod

-Fully Executed Copy

-Receiving Laboratory Copy

-Shipper Copy

-Sampler Copy

SAMPLE TEAM:

RECEIVED FOR LABORATORY BY:

No NF-3189

DATE: TIME:

**CRA**

15403-0(002)GN-NF006 FEB 23/2000

figure B3.1  
TYPICAL C-CHAIN OF CUSTODY FORM  
NAVY BANK AREA CHARACTERIZATION  
*Port of Tacoma/Occidental Chemical Corporation*



APPENDIX B

TABLES

**TABLE B2.1**  
**SAMPLING AND ANALYSIS SUMMARY**  
**CHARACTERIZATION OF THE NAVY BANK AREA**

<b>Sample Matrix</b>	<b>Analytical Parameters</b>	<b>Analytical Method <sup>(1)</sup></b>	<b>Estimated Number of Samples</b>	<b>Field Duplicates</b>	<b>Rinse Blanks</b>	<b>MS/MSD/Dup</b>
Sediment	Volatiles	8260	12	1	1 per day	1/1/0
	Semi-Volatiles	8270	8	1	1 per day	1/1/0
	Pesticides/PCBs	8081/8082	8	1	1 per day	1/1/0
	Metals	6010/7471	8	1	1 per day	1/0/1
	Total Organic Carbon	9060	8	1	1 per day	1/0/1

Notes:

- <sup>(1)</sup> Test Methods for Evaluating Solid Waste - Physical/Chemical Methods, SW-846, 3rd Edition, 1986 (with revisions).  
PCBs Polychlorinated Biphenyls.

TABLE B2.2

**SAMPLE CONTAINER, PRESERVATION AND HOLDING TIME PERIODS  
CHARACTERIZATION OF THE NAVY BANK AREA**

<i>Analyses</i>	<i>Sample Containers</i>	<i>Preservation</i>	<i>Maximum Holding Time</i>	<i>Notes</i>
<i>Sediment VCCs</i>	1 - 4 oz. glass jar with Teflon-lined septum	Cool 4°C	14 days from collection to analyses	Fill completely with as little head space as possible
SVOCs, Pesticides, PCBs	2 - 8 oz. glass jar	Cool 4°C	14 days from collection to extraction 40 days from extraction to analysis	Fill completely
Metals (except mercury)	1 - 4 oz. glass or HDPE jar	Cool 4°C	180 days from collection to analysis	Fill completely
Mercury	1 - 4 oz. glass jar	Cool 4°C	28 days from collection to analysis	Fill completely
Total Organic Carbon	1 - 4 oz. amber glass jar	Cool 4°C	28 days from collection to analysis	Fill completely

Notes:

HDPE High Density Polyethylene.  
 PCEs Polychlorinated Biphenyl.  
 SVOCs Semi-Volatile Organic Compound.  
 VOCs Volatile Organic Compound.

ATTACHMENT B-1  
LOGGING INFORMATION

APPENDIX C

QUALITY ASSURANCE PROJECT PLAN

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TABLE C10.1	QUALITY CONTROL CRITERIA (PERCENT)



## 1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) is Site specific and has been prepared for the characterization of the Navy Bank.

The objectives of this QAPP are to provide sufficiently thorough and concise descriptions of the measures to be applied during the characterization of the sediment such that the data generated will be of a known and acceptable level of precision and accuracy. This QAPP provides comprehensive information regarding the project personnel responsibilities, and sets forth specific procedures to be used during sampling of relevant environmental matrices and analyses of data.

This QAPP is referenced from the "Combined Sampling and Analysis Plan and Quality Assurance Project Plan for the Commencement Bay Nearshore/Tideflats Superfund Site - Hylebos Waterway Problem Areas", Final Report, prepared for the Hylebos Cleanup Committee June 17, 1994 (Waterway SAP). The sections of the Waterway SAP which are relevant to the sediment characterization have been modified as necessary and are presented herein.

## 2.0 PROJECT BACKGROUND

### 2.1 GENERAL

This QAPP provides Quality Assurance/Quality Control (QA/QC) criteria for work efforts associated with sediment sample analyses. Methods for sample analyses have been selected to provide results which characterize the sediment, such that the sampling objectives can be met.

### 3.0 PROJECT ORGANIZATION AND RESPONSIBILITY

A brief description of the duties of the key project personnel is presented below.

#### Project Director

- i) provides overall project management;
- ii) ensures professional services by the Contractor are cost effective and of highest quality;
- iii) ensures all resources of the Contractor are available on an as-required basis;
- iv) participates in key technical negotiations; and
- v) provides managerial and technical guidance to the Contractor's Coordinator.

#### Project Manager

- i) provides day-to-day project management;
- ii) provides managerial guidance to the QA/QC Officer - Sampling and Analytical Activities;
- iii) prepares and reviews reports;
- iv) conducts preliminary chemical data interpretation and assessment; and
- v) responsible for overall project completion in accordance with the approved design.

#### QA/QC Officer - Sampling and Analytical Activities

- i) oversees and reviews laboratory activities;
- ii) determines laboratory data corrective action;
- iii) performs analytical data validation and assessment;
- iv) reviews laboratory QA/QC;
- v) assists in preparation and review of final report;
- vi) provides technical representation for analytical activities;
- vii) oversees and reviews field activities;
- viii) provides managerial and technical guidance to the Field Sampling Supervisor;
- ix) performs field sampling performance audit(s);
- x) ensures that field and Chain of Custody records are properly maintained; and
- xi) determines field procedure corrective actions.

#### Field Sampling Supervisor

- i) provides immediate supervision of all on-Site activities;
- ii) provides field management of sample collection and field QA/QC;
- iii) provides technical representation for field activities; and
- iv) is responsible for maintenance of the field equipment.

#### Laboratory - Project Manager, Analytical Contractor

- i) ensures resources of laboratory are available on an as-required basis;
- ii) coordinates laboratory analyses;
- iii) supervises laboratory's in-house Chain of Custody;
- iv) schedules analyses of samples;
- v) oversees review of data;
- vi) oversees preparation of analytical reports; and
- vii) approves final analytical reports.

#### Laboratory - Quality Assurance/Quality Control Officer, Analytical Contractor

- i) overviews laboratory QA/QC;
- ii) overviews QA/QC documentation;
- iii) conducts detailed data review;
- iv) decides laboratory corrective actions, if required; and
- v) provides technical representation for laboratory QA/QC procedures.

#### Laboratory - Sample Custodian - Analytical Contractor

- i) receives and inspects the sample containers;
- ii) records the condition of the sample containers;
- iii) signs appropriate documents;
- iv) verifies Chain of Custody and their correctness;
- v) notifies laboratory Project Manager and laboratory QA/QC Officer of sample receipt and inspection;
- vi) assigns a unique laboratory identification number correlated to the field sample identification number, and enters each into the sample receiving log;
- vii) initiates transfer of samples to the appropriate lab sections with assistance from the laboratory project manager; and
- viii) controls and monitors access to and storage of samples and extracts.

The analytical laboratories selected to perform the analyses will be full-service chemical analytical laboratories participating in the State of Washington Department of Ecology (WDOE) Environmental Laboratory Accreditation Program and experienced in analyzing samples using Puget Sound Dredged Disposal Analysis (PSSDA) Guidance.

## **4.0 PROJECT OBJECTIVES**

### **4.1 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA**

The overall QA objective is to develop and implement procedures for sample collection and analyses which will provide data with an acceptable level of accuracy and precision.

Quality assurance measures for this project will begin with sample containers. Sample containers will be purchased from a certified manufacturer and will be precleaned (I-Chem Series 200 or equivalent).

### **4.2 LABORATORY QUALITY ASSURANCE**

The following subsections define the QA goals required to meet the Data Quality Objectives (DQOs) of the project.

#### **4.2.1 ACCURACY, PRECISION, AND SENSITIVITY OF ANALYSES**

The fundamental QA objective with respect to the accuracy, precision, and sensitivity of analytical data is to meet the QC acceptance criteria of each analytical protocol. Analytical methods and targeted detection limits listed have been specified to meet the sediment quality objective (SQO).

The targeted detection limits for sediments will be the SQO, or where these are not available, method detection limits (MDLs).

A summary of the targeted detection limits is provided in Table C4.1. It should be noted that these limits are targeted detection limits only; limits are highly matrix dependent and may not always be achieved.

The method accuracy (percent recovery) for sediment samples will be determined by spiking selected samples (matrix spikes) with the method recommended spiking compounds. Accuracy will be reported as the percent recovery of the spiking compound(s) and will compare with the criteria given in the appropriate methods, as identified in Section 7.0.

The method(s) precision (reproducibility between duplicate analyses) will be determined based on the duplicate analysis of matrix spike samples for organic parameters and duplicate sample analyses for inorganic parameters. Precision will be reported as Relative Percent Differences (RPDs) between duplicate analyses; acceptance criteria will be as specified in the appropriate methods identified in Section 7.0.

#### **4.2.2      COMPLETENESS, REPRESENTATIVENESS, AND COMPARABILITY**

A completeness requirement of 90 percent will be targeted for the program (see Section 13.1.3 for definition of completeness).

The quantity of samples to be collected has been estimated in an effort to effectively represent the population being studied. A summary of the sampling and analysis program is presented in Table C4.2.

One of the primary objectives of characterization for this study is to determine whether SQO criteria are exceeded. Comparison of analytical data to these criteria requires that the methods and procedures used are sufficient to reliably allow comparison to the criteria. Those analytical methods necessary to achieve data comparability and the required detection/quantitation levels are presented in Section 7.0.

#### **4.3          FIELD MEASUREMENT QUALITY ASSURANCE**

Measurement data will be generated during field activities. These activities include, but are not limited to, the following:

- i)        documenting time and weather conditions; and
- iii)     observation of sample appearance and other conditions.

The general QA objective for measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the use of standardized procedures.

## 5.0 SAMPLING PROCEDURES

The sample collection procedures are described in the Sampling and Analysis Plan contained in Appendix B of the Work Plan.

The sample container, preservation, shipping, and packaging requirements are identified in Table C5.1 and in Section 6.3.



## **6.0 SAMPLE CUSTODY AND DOCUMENT CONTROL**

The following documentation procedures will be used during sampling and analysis to provide Chain of Custody control during transfer of samples from collection through storage. Record keeping documentation will include use of the following:

- i) field log books (bound with numbered pages) to document sampling activities in the field;
- ii) labels to identify individual samples;
- iii) Chain of Custody record sheet to document analyses to be performed; and
- iv) laboratory sample custody log book.

### **6.1 FIELD LOG BOOK**

In the field, the sampler will record the following information in the field log book (bound) for each sample collected:

- i) project number;
- ii) sample matrix;
- iii) name of sampler;
- iv) sample source;
- v) time and date;
- vi) pertinent data (e.g., depth);
- vii) analysis to be conducted;
- viii) sampling method;
- ix) appearance of each sample (i.e., color, evidence of soil staining);
- x) preservation added, if any;
- xi) number of sample bottles collected; and
- xii) pertinent weather data.

Each field log book page will be signed by the sampler.

## 6.2 SAMPLE NUMBERING

A unique sample numbering system will be used to identify each collected sample. This system will provide a tracking number to allow retrieval and cross-referencing of sample information. The sample numbering system to be used is described as follows:

Example: S-121695 - AA-XXX  
Where: S - Designates sample Type  
(SE=Sediment)  
121695: Date of collection (mm/dd/yy)  
AA: Sampler initials  
XXX: Unique sample number

QC samples will also be numbered with a unique sample number.

## 6.3 CHAIN OF CUSTODY RECORDS

Chain of Custody forms will be completed for all samples collected during the program.

The Chain of Custody form will document the transfer of sample containers. Custody seals will be placed on each cooler. The cooler will then be sealed with packing tape. Sample container labels will include sample number, place of collection and date and time of collection. All samples will be refrigerated using wet ice at 4°C ( $\pm 2^\circ\text{C}$ ) and delivered to the analytical laboratory within 24 to 48 hours of collection. All samples will be delivered to the laboratory by commercial courier or Contractor personnel. All samples will be stored at 4°C ( $\pm 2^\circ\text{C}$ ) at the laboratory.

The Chain of Custody record, completed at the time of sampling, will contain, but not be limited to, the sample number, date and time of sampling, and the name of the sampler. The Chain of Custody document will be signed, timed, and dated by the sampler when transferring the samples.

Each sample cooler being shipped to the laboratory will contain a Chain of Custody form. The Chain of Custody form will consist of four copies which will be distributed as follows: The shipper will maintain a copy while the other three copies will be enclosed in a waterproof envelop within the cooler with the samples. The cooler will then be sealed properly for shipment. The laboratory, upon receiving the samples, will complete the three remaining copies. The laboratory will maintain one copy for their records. One copy will be returned to the QA/QC Officer-Sampling and Analytical

Activities upon receipt of the samples by the laboratory. One copy will be returned with the data deliverables package.

Upon receipt of the cooler at the laboratory, the shipping cooler and the custody seal will be inspected by the Sample Custodian. The condition of the cooler and the custody seal will be noted on the Chain of Custody record sheet by the Sample Custodian. The Sample Custodian will record the temperature of one sample (or temperature blank) from each cooler and the temperature will be noted on the Chain of Custody. If the shipping cooler seal is intact, the sample containers will be accepted for analyses. The Sample Custodian will document the date and time of receipt of the container, and sign the form.

If damage or discrepancies are noticed (including sample temperature exceedances), they will be recorded in the remarks column of the record sheet, dated and signed. Any damage or discrepancies will be reported to the Laboratory Project Manager and Laboratory QA/QC Officer before samples are processed.

#### **6.4      SAMPLE DOCUMENTATION IN THE LABORATORY**

Each sample or group of samples shipped to the laboratory for analysis will be given a unique identification number. The Sample Custodian will record the client name, number of samples and date of receipt of samples in the Sample Control Log Book. Samples removed from storage for analyses will be documented in the Sample Control Log Book.

The laboratory will be responsible for maintaining analytical log books and laboratory data as well as a sample (on hand) inventory for submittal to the QA/QC Officer - Sampling and Analytical Activities on an "as required" basis. Raw laboratory data produced from the analysis of samples submitted for this program will be inventoried and maintained by the laboratory for a period of five years at which time the QA/QC Officer - Sampling and Analytical Activities will advise the laboratory regarding the need for additional storage.

#### **6.5      STORAGE OF SAMPLES**

After the Sample Custodian has completed the Chain of Custody forms and the incoming sample log, the Chain of Custody will be checked to ensure that all samples are stored in the appropriate locations. All samples will be stored within an access

controlled custody room and will be maintained at 4 °C ( $\pm 2^{\circ}\text{C}$ ) until all analytical work is complete.

## **6.6      SAMPLE DOCUMENTATION**

Evidentiary files for the entire project shall be inventoried and maintained by the QA/QC Officer - Sampling and Analytical Activities and shall consist of the following:

- i)      project related plans;
- ii)     project log books;
- iii)    field data records;
- iv)    sample identification documents;
- v)     Chain of Custody records;
- vi)    report notes, calculations, etc.;
- vii)   lab data, etc.;
- viii)  references, copies of pertinent literature;
- ix)    miscellaneous - photos, maps, drawings, etc.; and
- x)    copies of all final reports pertaining to the project.

The evidentiary file materials shall be the responsibility of the Project Manager with respect to maintenance and document removal.

## 7.0 ANALYTICAL PROCEDURES FOR CHEMICAL ANALYSES

Samples collected for laboratory chemical analyses will be analyzed for the parameters listed in Table C4.1, using the methods cited in Table C4.2. These methods have been selected to meet the DQOs for each sampling activity. All reporting and deliverables will be consistent with the Puget Sound Dredged Disposal Analysis (PSDDA) QA2 requirements (see Section 9.2).

All sample results will be calculated using external standards with the exception of the samples analyzed by gas chromatograph/mass spectrometer (GC/MS); these methods employ the use of internal standards or isotopic dilution for analyte quantitation. The specific procedures for target analyte quantitation are detailed in the appropriate analytical methods.

Targeted method detection limits will be consistent with those presented in Table C4.1. Modifications to established analytical methods may be necessary to achieve project DQOs. In some cases, the sample size and final volume of the digestate or extract may be adjusted to achieve required minimum quantitation levels. These modifications will be made in accordance with PSDDA Guidance.

## **8.0 CALIBRATION PROCEDURES AND FREQUENCY**

Calibration of instrumentation is required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity to meet established reporting limits. Each instrument is calibrated with standard solutions appropriate to the type of instrument and the linear range established for the analytical method. The frequency of calibration and the concentration of calibration standards is determined by the manufacturers guidelines, the analytical method, or the requirements of special contracts.

A bound notebook will be kept with each instrument requiring calibration in which will be recorded activities associated with QA monitoring and repairs program. These records will be checked during periodic equipment review and internal and external QA/QC audits.

### **8.1 GAS CHROMATOGRAPHY/MASS SPECTROMETRY (GC/MS)**

It is necessary to establish that a given GC/MS meets the standard mass spectral abundance criteria prior to initiating any ongoing data collection. This is accomplished through the analyses of tuning compounds as specified in the analytical methods.

Calibration of the GC/MS system will be performed daily at the beginning of the day or with each 12 hours of instrument operating time. All method-specified calibration criteria must be met prior to sample analyses. All calibrations must be performed using either average response factors or first-order linear regression (with a correlation coefficient requirement of  $\geq 0.995$ ). Higher order fits will not be allowed.

### **8.2 HIGH RESOLUTION GAS CHROMATOGRAPHY/ HIGH RESOLUTION MASS SPECTROMETRY (HRGC/HRMS)**

All calibration and quantitation will be in accordance with the cited method.

### **8.3 GAS CHROMATOGRAPHY (GC)**

Quantification of samples that are analyzed by GC/MS with element selective detectors shall be performed by external standard calibration. Standards containing the compounds of interest will be analyzed at a minimum of three concentrations to

establish the linear range of the detector. Single point calibration will be performed at the beginning of each day and at every tenth injection. The response factors from the single point calibration will be checked against the average response factors from multi-level calibration. If deviations in response factors are greater than those allowed by the analytical method protocols, then system recalibration will be performed. Alternatively, fresh calibration standards will be prepared and analyzed to verify instrument calibration.

All method-specified calibration criteria must be met prior to sample analyses. All calibrations must be performed using either average response factors or first-order linear regression (with a correlation coefficient requirement of  $\geq 0.995$ ). Higher order fits will not be allowed.

#### **8.4      INSTRUMENTATION FOR INORGANIC ANALYSES**

Inductively coupled argon plasma (ICAP) instrumentation will be calibrated using a minimum of a blank and one standard. Mercury and cyanide instrumentation will be calibrated using a blank and a minimum of three calibration standards (four for mercury), with a correlation coefficient requirement of  $\geq 0.995$ . All remaining method-specified calibration procedures will be performed and acceptance criteria will be met prior to sample analyses.

## 9.0 DATA REDUCTION, VALIDATION ASSESSMENT, AND REPORTING

### 9.1 GENERAL

The contract laboratory will perform analytical data reduction and validation in-house under the direction of the Laboratory QA/QC Officer. The Laboratory QA/QC Officer will be responsible for assessing data quality and advising of any data which were rated "preliminary" or "unacceptable" or other qualifications based on the QC criteria outlined in the relevant methods, which would caution the data user of possible unreliability. Data reduction, validation and reporting by the laboratory will be conducted as detailed in the following:

- i) raw data produced and checked by the responsible analysts is turned over for independent review by another analyst;
- ii) the area supervisor reviews the data for attainment of quality control criteria presented in the referenced analytical methods;
- iii) upon completion of all reviews and acceptance of the raw data by the laboratory operations manager, a computerized report will be generated and sent to the Laboratory QA/QC Officer;
- iv) the Laboratory QA/QC Officer will complete a thorough inspection of all reports;
- v) the Laboratory QA/QC Officer and area supervisor will decide whether any sample reanalysis is required; and
- vi) upon acceptance of the preliminary reports by the Laboratory QA/QC Officer, final reports will be generated and signed by the Laboratory Project Manager.

Validation of the analytical data will be performed by the QA/QC Officer - Sampling and Analytical Activities. The data validation will be performed in accordance with the following documents: "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", EPA 540/R-94-012, February 1994; and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review", EPA 540/R-94-013, February 1994.

Assessment of analytical and in-house data will include checks on data consistency by looking for comparability of duplicate analyses, comparability to previous data from the same sampling location (if available), adherence to accuracy and precision control criteria detailed in this QAPP and anomalously high or low parameter values. The



results of these data validations will be reported to the Project Manager and the contract laboratory, noting any discrepancies and their effect upon acceptability of the data.

Raw data from field measurements and sample collection activities that are used in project reports will be appropriately identified and appended to the report. Where data have been reduced or summarized, the method of reduction will be documented in the report. Field data will be audited for anomalously high or low values that may appear to be inconsistent with other data.

## **9.2      LABORATORY REPORTING, DATA, PRESENTATION, AND FINAL REPORT**

Reporting and deliverables shall include, but not be limited to, all items listed in Table D9.1.

All sample data and corresponding QA/QC data as specified in the analytical methods, shall be maintained accessible either in hard copy or on magnetic tape or disk (computer data files).

The laboratory will submit two (2) copies of the final analytical report within 21 calendar days of receipt of the final sample included in the sample delivery group (SDG).

## **9.3      DOCUMENT CONTROL SYSTEM**

A document control system ensures that all documents are accounted for when the project is complete.

A project number will be assigned to the project. This number will appear on sample identification tags, log books, data sheets, control charts, project memos and analytical reports, document control logs, corrective action forms and logs, QA plans, and other project analytical records.

## **9.4      QC CHECK POINTS AND DATA FLOW**

The following specific QC check points will be common to all metals, GC, and GC/MS analyses. They are presented with the decision points:

#### Chemist - bench level checks

- i) systems check: sensitivity, linearity, and reproducibility within specified limits;
- ii) duplicate analyses within control limits;
- iii) matrix spike results within control limits;
- iv) surrogate spike results within control limits (organics only); and
- v) calculation/data reduction checks: calculations cross-checked, any discrepancies between forms and results evident, results tabulated sequentially on the correct forms.

#### Laboratory Project Manager

- i) systems operating within limits;
- ii) data transcription correct;
- iii) data complete; and
- iv) data acceptable.

#### Sample Control

- i) samples returned to sample control following analysis.

#### Laboratory QA/QC Officer

- i) QA objectives met;
- ii) QC checks are completed; and
- iii) final data and report package is complete.

## **10.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY**

### **10.1 QC FOR LABORATORY ANALYSES**

Specific procedures related to internal laboratory QC samples are described in the following subsections.

#### **10.1.1 REAGENT BLANKS**

A reagent blank will be analyzed by the laboratory at a frequency of one blank per analytical batch. The reagent blank, an aliquot of analyte-free water or solvent, will be carried through the entire analytical procedure.

#### **10.1.2 MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)/DUPLICATE ANALYSES**

An MS/MSD sample will be analyzed for organic parameters (except HRGC/HRMS) and a duplicate and matrix spike will be analyzed for inorganic parameters at a minimum frequency of one per analytical batch. Acceptable criteria and analytes that will be used for matrix spikes are identified in Table C10.1. Where method specified limits were not available, general control limits were used. Percent spike recoveries will be used to evaluate analytical accuracy while percent relative standard deviation or the RPD between duplicate analyses will be used to assess analytical precision.

#### **10.1.3 SURROGATE ANALYSES**

Surrogates are organic compounds which are similar to the analytes of interest, but which are not normally found in environmental samples. Surrogates are added to samples to monitor the effect of the matrix on the accuracy of the analysis. Every blank, standard and environmental sample analyzed by GC or GC/MS, including MS/MSD samples, will be spiked with surrogate compounds prior to sample preparation.

The compounds that will be used as surrogates and the levels of recommended spiking are specified in the methods. Surrogate spike recoveries must fall within the control limits specified in the methods. If surrogate recoveries are excessively low (<10 percent), the laboratory will contact the QA/QC Officer - Sampling and Analytical Activities for further instructions. Dilution of samples to bring the analyte concentration

into the linear range of calibration may dilute the surrogates out of the quantification limit. Reanalysis of these samples is not required. Assessment of analytical quality in these cases will be based on the MS/MSD sample analysis results.

## **10.2      QC FOR FIELD SAMPLING**

To assess the quality of data resulting from the field sampling program, field duplicate and field blank samples will be collected (where appropriate) and submitted to the analytical laboratory as samples.

### **10.2.1      FIELD (RINSE) BLANKS**

Field blanks will be used during the sampling programs to detect contamination introduced through sample collection procedures and equipment, external field conditions, sample transport, sample container preparation, sample storage, and/or the analytical process.

### **10.2.2      FIELD DUPLICATE SAMPLES**

Field duplicate samples will be collected and used to assess the aggregate precision of sampling techniques and laboratory analysis. For every twenty investigative samples, a field duplicate sample will be collected using standard sampling procedures. This duplicate will be packed and shipped to the laboratory for analysis.

## 11.0 PERFORMANCE AND SYSTEM AUDITS

For the purpose of external evaluation, performance evaluation check samples are analyzed periodically by the laboratory. Internally, the evaluation of data from these samples is done on a continuing basis over the duration of a given project.

The QA/QC Officer - Sampling and Analytical Activities may carry out performance and/or systems audits to insure that data of known and defensible quality are consistently produced during this program.

Systems audits are qualitative evaluations of all components of field and laboratory quality control measurement systems. They determine if the measurement systems are being used appropriately. The audits may be carried out before all systems are operational, during the program, or after completion of the program. Such audits typically involve a comparison of the activities given in the QA/QC plan described herein, with activities actually scheduled or performed. A special type of systems audit is the data management audit. This audit addresses only data collection and management activities.

The performance audit is a quantitative evaluation of the measurement systems used for a monitoring program. It requires testing the measurement systems with samples of known composition or behavior to quantitatively evaluate precision and accuracy. A performance audit may be carried out by or under the auspices of the QA/QC Officer - Sampling and Analytical Activities without the knowledge of the analyst during each sampling event for this program.

It should be noted, however, that any additional external QA audits will only be performed if deemed necessary.

## 12.0 PREVENTATIVE MAINTENANCE

This section applies to both field and laboratory equipment. Specific preventive maintenance procedures for field equipment will be consistent with the manufacturer's guidelines. Specific preventive maintenance protocols for laboratory equipment will be consistent with the contract laboratory's standard operating procedures.

All analytical instruments to be used in this project will be serviced by laboratory personnel at regularly scheduled intervals in accordance with the manufacturers' recommendations. Instruments may also be serviced at other times due to failure. Requisite servicing beyond the abilities of laboratory personnel will be performed by the equipment manufacturer or their designated representative.

Routine maintenance of the instruments will be performed as per manufacturers' recommendations. The Laboratory Project Manager is responsible for the preventive maintenance of the instruments.

### 13.0 SPECIFIC ROUTINE PROCEDURES USES TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

#### 13.1 QA MEASUREMENT QUALITY INDICATORS

##### 13.1.1 PRECISION

Precision will be assessed by comparing the analytical results between duplicate spike analyses. Precision as percent relative difference will be calculated as follows for values significantly greater than the associated detection limit:

$$\text{Precision} = \left| \frac{(D_2 - D_1)}{(D_1 + D_2)/2} \right| \times 100$$

D<sub>1</sub> = matrix spike recovery

D<sub>2</sub> = matrix spike duplicate spike recovery

For results near the associated detection limits, precision will be assessed based on the following criteria:

$$\text{Precision} = \left| \text{Original result} - \text{duplicate result} \right| < \text{CRDL}$$

##### 13.1.2 ACCURACY

Accuracy will be assessed by comparing a set of analytical results to the accepted or "true" values that would be expected. In general, MS/MSD and check sample recoveries will be used to assess accuracy. Accuracy as percent recovery will be calculated as follows:

$$\text{Accuracy} = \frac{A - B}{C} \times 100$$

A = The analyte determined experimentally from the spike sample

B = The background level determined by a separate analysis of the unspiked sample

C = The amount of spike added

In some cases, MS and/or MSD recoveries may not be available due to elevated levels of the spiked analyte in the investigative sample. In such cases, accuracy will be assessed based on surrogate spike recoveries and/or laboratory control samples.

### 13.1.3 COMPLETENESS

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under normal conditions.

To be considered complete, the data set must contain all QC check analyses verifying precision and accuracy for the analytical protocol. In addition, all data are reviewed in terms of stated goals in order to determine if the database is sufficient.

When possible, the percent completeness for each set of samples will be calculated as follows:

$$\text{Completeness} = \frac{\text{usable data obtained}}{\text{total data planned}} \times 100 \text{ percent}$$

### 13.1.4 OUTLIERS

Procedures discussed previously will be followed for documenting deviations. In the event that a result deviates significantly from method established control limits, this deviation will be noted and its effect on the quality of the remaining data assessed and documented.



#### 14.0 CORRECTIVE ACTION

The need for corrective action may be identified by system or performance audits or by standard QC procedures. The essential steps in the corrective actions system will be:

- i) checking the predetermined limits for data acceptability beyond which corrective action is required;
- ii) identifying and defining problems;
- iii) assigning responsibility for investigating the problem;
- iv) investigating and determining the cause of the problem;
- v) determination of a corrective action to eliminate the problem (this may include reanalysis or resampling and analyses);
- vi) assigning and accepting responsibility for implementing the corrective action;
- vii) implementing the corrective action and evaluating the effectiveness;
- viii) verifying that the corrective action has eliminated the problem; and
- ix) documenting the corrective action taken.

For each measurement system, the laboratory QA/QC Officer will be responsible for initiating the corrective action and the Laboratory Project Manager will be responsible for implementing the corrective action.

## 15.0 QUALITY ASSURANCE REPORTS

Final reports will contain a discussion on QA/QC summarizing the quality of the data collected and/or used as appropriate for each phase of the project. The Project Manager who has responsibility for these summaries, will rely on written reports/memoranda documenting the data assessment activities, performance and systems audits and footnotes identifying qualifications to the data, if any.

Each summary of sampling activities will include a tabulation of the data including:

- i) field blank and field duplicate sample results;
- ii) maps showing well locations; and
- iii) an explanation of any sampling conditions or quality assurance problems and their effect on data quality.

QA reports will be prepared by the QA/QC Officer - Sampling and Analytical Activities following receipt of all analytical data. These reports will include discussions of the following and their effects on the quality of the data reported:

- i) sample holding times,
- ii) laboratory/reagent blank data
- iii) surrogate spike, matrix spike and matrix spike duplicate data;
- iv) field QA/QC data;
- v) pertinent instrument performance per method protocols; and
- vi) audit results (if performed).

In addition, the QA reports will summarize all QA problems, and give a general assessment of QA results versus control criteria for such parameters as accuracy, precision, etc.

The QA reports will be forwarded to the Project Manager.

## 16.0 ADDITIONAL REFERENCES

- USEPA. 1984. Guidance for preparation of combined work/quality assurance project plans for environmental monitoring (OWRS QA-1). Office of Water Regulations and Standards, USEPA, Washington, DC.
- USEPA. 1993. Administrative order on consent and statement of work for pre-remedial design study, Hylebos Waterway of the Commencement Bay Nearshore/Tidalflats superfund site. USEPA, Region X, Seattle, WA.
- Garrett, B.C., D. R. Jackson, W.E. Schwartz, and J.S. Warner. 1984. Solid waste leaching procedure. Report: SW-924. Office of Solid Waste and Emergency Response, USEPA, Washington, D.C.
- Myers, T.E., R.P. Gambrell, and M.E. Tittlebaum. 1991. Design of an improved column leaching apparatus for sediments and dredged materials. Report D-91-3. U.S. Army of Corps of Engineers Waterways Experiment Station, Vicksburg, MS.
- Myers, T.E., J.M. Brandon, and C.B. Price. 1992. Recent developments in leachate testing and evaluations. Report D-92-92. U.S. Army of Corps of Engineers Waterways Experiment Station, Vicksburg, MS.
- PSEP. 1989a. Recommended protocols for metals in Puget Sound water, sediment and tissue samples. Final Report TC-3090-04. Prepared for U.S. Army Corps of Engineers, Seattle District, as part of the PSDDA.
- PSEP. 1989b. Recommended protocols for measuring organic compounds in Puget Sound sediment and tissue samples. Final Report TC-3991-04. Prepared for USEPA, Region X, Office of Puget Sound. Puget Sound Estuary Program. Tetra Tech, Inc., Bellevue, WA.
- PTI. 1989. Puget Sound dredged disposal analysis guidance manual - data quality evaluation for proposed dredged material disposal projects. Prepared for the Washington State of Ecology, Olympia, WA.
- USACOE 1986. Final environmental impact statement supplement technical appendices, carrier battle group (CVBG) homeporting in the Puget Sound area, Washington State. U.S. Army Corps of Engineers, Seattle District.

## APPENDIX C

### TABLES

**ANALYTICAL PARAMETERS AND TARGETED DETECTION LIMITS  
CHARACTERIZATION OF THE NAVY BANK AREA**

<i>Parameter</i>	<i>CAS Number</i>	<i>Targeted Detection Limit <sup>(1)</sup></i>
<b><i>Volatiles (µg/Kg)</i></b>		
Trichloroethene	79-01-6	10 <sup>(2)</sup>
Tetrachloroethene	127-18-4	57
Ethylbenzene	100-41-4	10
Total Xylenes	1330-20-7	40
<b><i>Semi-Volatiles (µg/Kg)</i></b>		
Phenol	108-95-2	420
1,3-Dichlorobenzene	541-73-1	170
1,4-Dichlorobenzene	106-46-7	110
1,2-Dichlorobenzene	95-50-1	50
2-Methylphenol	95-48-7	63
4-Methylphenol	106-44-5	670
Hexachloroethane	67-72-1	330 <sup>(2)</sup>
2,4-Dimethylphenol	105-67-9	29
1,2,4-Trichlorobenzene	120-82-1	51
Naphthalene	91-20-3	2100
Hexachlorobutadiene	87-68-3	11
2-Methylnaphthalene	91-57-6	670
Dimethylphthalate	131-11-3	160
Acenaphthylene	208-96-8	1300
Acenaphthene	83-32-9	500
Dibenzofuran	132-64-9	540
Diethylphthalate	84-66-2	200
Fluorene	86-73-7	540
n-Nitrosodiphenylamine	86-30-6	28
Hexachlorobenzene	118-74-1	22
Pentachlorophenol	87-86-5	360
Phenanthrene	85-01-8	1500
Anthracene	120-12-7	960
Di-n-butylphthalate	84-74-2	1400
Fluoranthene	206-44-0	2500
Pyrene	129-00-0	3300
Butyl benzyl phthalate	85-68-7	900
Benzo(a)anthracene	56-55-3	1600
Chrysene	218-01-9	2800
bis(2-Ethylhexyl)phthalate	117-81-7	1300
Di-n-octyl phthalate	117-84-0	6200
Benzo(b)fluoranthene	205-99-2	330 <sup>(2)</sup>

TABLE C4.1

**ANALYTICAL PARAMETERS AND TARGETED DETECTION LIMITS  
CHARACTERIZATION OF THE NAVY BANK AREA**

<i>Parameter</i>	<i>CAS Number</i>	<i>Targeted Detection Limit <sup>(1)</sup></i>
<b><i>Semi-Volatiles (µg/Kg) (Cont'd.)</i></b>		
Benzo(k)fluoranthene	207-08-9	330 <sup>(2)</sup>
Benzo(a)pyrene	50-32-8	1600
Indeno(1,2,3-cd)pyrene	193-39-5	690
Dibenz(a,h)anthracene	53-70-3	230
Benzo(g,h,i)perylene	191-24-2	720
Benzyl alcohol	100-51-6	73
Benzoic acid	65-85-0	650
<b><i>Pesticides/PCBs (µg/Kg)</i></b>		
gamma-BHC (Lindane)	58-89-9	1.7 <sup>(2)</sup>
Heptachlor	76-44-8	1.7 <sup>(2)</sup>
Aldrin	309-00-2	1.7 <sup>(2)</sup>
Dieldrin	60-57-1	3.3 <sup>(2)</sup>
4,4'-DDE	72-55-9	9
4,4'-DDD	72-54-8	16
4,4'-DDT	50-29-3	34
alpha-Chlordane	5103-71-9	1.5 <sup>(2)</sup>
gamma-Chlordane	5103-74-2	1.5 <sup>(2)</sup>
Total PCBs	1336-33-3	300
<b><i>Metals (mg/Kg)</i></b>		
Antimony	7440-36-0	150
Arsenic	7440-38-2	57
Cadmium	7440-43-9	5.1
Chromium	7440-47-3	1.0 <sup>(2)</sup>
Copper	7440-50-8	390
Lead	7440-92-1	450
Mercury	7440-97-6	59
Nickel	7440-02-0	140
Silver	7440-22-4	6.1
Zinc	7440-66-6	410
<b><i>General (mg/Kg)</i></b>		
Total Organic Carbon	-	10

Notes:

<sup>(1)</sup> Unless noted otherwise, all values are sediment quality objectives (SQOs).<sup>(2)</sup> Method Detection Limit (MDL).

PCBs Polychlorinated Biphenyls.

TABLE C4.2

**SAMPLING AND ANALYSIS SUMMARY  
CHARACTERIZATION OF THE NAVY BANK AREA**

<b>Sample Matrix</b>	<b>Analytical Parameters</b>	<b>Analytical Method <sup>(1)</sup></b>	<b>Estimated Number of Samples</b>	<b>Field Duplicates</b>	<b>Field Blanks</b>	<b>MS/MSD/Dup</b>
Sediment	Volatiles	8260	12	1	1 per day	1/1/0
	Semi-Volatiles	8270	8	1	1 per day	1/1/0
	Pesticides/PCBs	8081/8082	8	1	1 per day	1/1/0
	Metals	6010/7471	8	1	1 per day	1/0/1
	Total Organic Carbon	9060	8	1	1 per day	1/0/1

Notes:

- <sup>(1)</sup> Test Methods for Evaluating Solid Waste - Physical/Chemical Methods, SW-846, 3rd Edition, 1986 (with revisions).  
PCBs: Polychlorinated B phenyls.

TABLE C5.1

**SAMPLE CONTAINER, PRESERVATION AND HOLDING TIME PERIODS  
CHARACTERIZATION OF THE NAVY BANK AREA**

<i>Analyses</i>	<i>Sample Containers</i>	<i>Preservation</i>	<i>Maximum Holding Time</i>	<i>Notes</i>
<b>Sediment</b>				
VOC's	1 - 4 oz. glass jar with Teflon-lined septum	Cool 4°C	14 days from collection to analyses	Fill completely with as little head space as possible
SVOCs, Pesticides, PCBs	2 - 8 oz. glass jar	Cool 4°C	14 days from collection to extraction 40 days from extraction to analysis	Fill completely
Metals (except mercury)	1 - 4 oz. glass or HDPE jar	Cool 4°C	180 days from collection to analysis	Fill completely
Mercury	1 - 4 oz. glass jar	Cool 4°C	28 days from collection to analysis	Fill completely
Total Organic Carbon	1 - 4 oz. amber glass jar	Cool 4°C	28 days from collection to analysis	Fill completely

Notes:

HDPE High Density Polyethylene.  
 PCBs Polychlorinated Biphenyl.  
 SVOCs Semi-Volatile Organic Compound.  
 VOCs Volatile Organic Compound.



**TABLE C9.1**

**PSDDA QA2 REQUIREMENTS  
CHARACTERIZATION OF THE NAVY BANK AREA**

**ORGANIC COMPOUNDS**

The following documentation is needed for organic compounds (including Contract Laboratory Procedure [CLP] summary forms and all associated raw data).

- A cover letter referencing or describing the procedure used and discussing any analytical problems.
- Reconstructed ion chromatograms for Gas Chromatograph/Mass Spectrometer (GC/MS) analyses for each sample.
- Mass spectra of detected target compounds (GC/MS) for each sample and associated library spectra.
- GC/Electron Capture Detector (ECD) and/or GC/Flame Ionization Detector (FID) chromatographs for each sample.
- Raw data quantification reports for each sample.
- A calibration data summary reporting calibration range used (and decafluorotriphenylphosphine [DFTPP] and bromofluorobenzene [BFB] spectra and quantification report for GC/MS analyses).
- Final dilution volumes, sample size, wet-to-dry ratios, and instrument detection limit.
- Analyte concentrations with reporting units identified (to two significant figures unless otherwise justified).
- Quantification of all analytes in method blanks (ng/sample).
- Method blanks associated with each sample.
- Recovery assessments and a replicate sample summary (laboratories should report all surrogate spike recovery data for each sample; a statement of the range of recoveries should be included in reports using these data).
- Data qualification codes and their definitions.

**METALS/CONVENTIONALS**

The data report package for analyses for each sample should include the following including CLP summary forms and all associated raw data):

- Tabulated results in units as specified for each matrix in the analytical protocols, validated and signed in original by laboratory manager.
- Any data qualifications and explanation for any variance from the analytical protocols.
- Results for all the Quality Assurance/Quality Control (QA/QC) checks initiated by the laboratory.
- Tabulation of instrument and method detection limits.

All contract laboratories are required to submit results that are supported by sufficient backup data and quality assurance reports to enable independent QA reviewers to conclusively determine the quality of the data. The laboratory should be able to supply legible photocopies of original data sheets with sufficient information to unequivocally identify:

- Calibration results.
- Calibration and preparation blanks.
- Samples and dilutions.
- Duplicates and spikes.
- Any anomalies in instrument performance or unusual instrumental adjustments.

TABLE C10.1

QUALITY CONTROL CRITERIA (PERCENT)  
CHARACTERIZATION OF THE NAVY BANK AREA

<i>Parameters</i>	<i>Acceptable Recovery</i>	<i>RPD</i>
<b><i>Volatiles</i></b>		
Trichloroethene	62-137	24
Tetrachloroethene	70-130	20
Ethyl benzene	70-130	20
Total Xylenes	70-130	20
<b><i>Semi-Volatiles</i></b>		
Phenol	26-90	35
1,4-Dichlorobenzene	28-104	27
1,2,4-Trichlorobenzene	38-107	23
Acenaphthene	31-137	19
Pentachlorophenol	17-109	47
Pyrene	35-142	36
<b><i>Pesticides/PCBs</i></b>		
gamma-BHC (lindane)	46-127	50
Heptachlor	35-130	31
Aldrin	34-132	43
Dieldrin	31-134	38
4,4'-DDT	23-134	50
Total PCBs	45-124	50
<b><i>Metals</i></b>		
Antimony	75-125	35
Arsenic	75-125	35
Cadmium	75-125	35
Chromium	75-125	35
Copper	75-125	35
Lead	75-125	35
Mercury	75-125	35
Nickel	75-125	35
Silver	75-125	35
Zinc	75-125	35

Notes:

PCBs      Polychlorinated Biphenyls.  
RPD      Relative Percent Difference.

**APPENDIX B**  
**Phase 2 Sampling and Analysis Plan Addendum**  
**and**  
**Field Activities Report**

## MEMORANDUM

To: Suzanne Dudziak, Port of Tacoma  
cc: Erica Hoffman, EPA; Alison Hiltner, EPA; Dick Gilmur, Port of Tacoma; Maury Wassman, Oxy; Al Meek, Oxy; Sally Fisher, GeoEngineers; Matt Bond, GeoEngineers.  
  
From: Clay Patmont and Kim Magruder  
Date: May 19, 2000  
  
Re: **Phase 1 – Hylebos Mouth Cleanup Characterization of the Navy Bank Area Round 2 – Bioassay Testing**

---

### **Introduction**

This Memorandum addresses the tasks associated with the recollection of sediment from selected bank and side-slope grids of the Navy and Marine Corps Reserve property for confirmatory bioassay testing. Surface sediment composites were previously collected from this area in February 2000 and submitted for chemical analyses. Three sediment composites from the subtidal area and one sediment composite from the intertidal area contained chemical concentrations marginally in excess of the project sediment quality objectives (SQOs). These composites will be recollected and submitted for confirmatory bioassay testing, to verify or refute the need for sediment cleanup in this area.

### **Project Team and Responsibilities**

The project team and responsibilities for tasks associated with the Round 2 sampling are as follows:

- Ms. Magruder of Anchor will provide overall direction to the field sampling in terms of logistics, personnel assignments, and field operations (including coordination of reference sediment collection for sediment bioassay analyses).
- Mr. Mark Harris from Analytical Resources, Inc. (ARI), located in Seattle, Washington, will be responsible for the sediment chemistry analyses.
- Ms. Jennifer Stewart from EVS Environment Consultants located in North Vancouver, British Columbia, will be responsible for the sediment bioassay analyses.

All other aspects of field sample collection will proceed as described in the existing Work Plan and SAP (CRA 2000).

### **Sample Collection and Handling Procedures**

The field effort will consist of sampling a total of 4 grid areas, and compositing two to four discrete surface samples collected within each grid as shown in Figure 1. Sampling

locations and protocols will be equivalent to those used during the previous (February 2000) sampling. No subsurface sediments (cores) will be collected during this task.

### **Sample Positioning**

All sample locations will be documented using a differential global positioning system (DGPS) with a horizontal accuracy of  $\pm 3$  feet. The horizontal datum will be Washington State Plane South Zone (NAD 27) coordinates. Depth of water will be measured to an accuracy of 0.1 feet. The project vertical datum will be the Port of Tacoma Mean Lower Low Water (MLLW).

### **Sediment Sample Collection and Handling Procedures**

Anchor will coordinate sediment sample collection, compositing, and transport to the appropriate laboratories. Surface sediments will be collected and processed as described in the existing Work Plan and SAP (CRA 2000). It is anticipated that a van Veen grab sampler will be used to collect all surface samples (0 to 10 centimeters [cm]).

Station locations are provided in Table 1 and the sample compositing scheme and sample numbers are provided in Table 2. All samples will be maintained according to the appropriate holding times and temperatures for each analysis as represented in Table B2.2 of the existing SAP (CRA 2000). Sediment samples for bioassay testing will be collected in high density polyethylene (HDPE) buckets. Two one-gallon HDPE buckets will be filled completely (to minimize head-space), and will be stored on ice or at 4°C at all times. Bioassay testing will commence before the maximum recommended holding time of 14 days.

### **Chemical/Conventional Analyses**

All chemical testing will be conducted in accordance with the original Work Plan (CRA 2000), with the exception that samples will not be analyzed for volatile organic compounds since these were not detected in any of the Round 1 samples.

### **Biological Testing**

All bioassay testing will be conducted in accordance with the most up to date Puget Sound Estuary Program (PSEP) protocols (PSEP 1995) and sediment management annual review meeting (SMARM) updates. Bioassay determinations will include three toxicity tests; the acute sublethal 10-day amphipod test; the acute bivalve larvae test; and the chronic 20-day polychaete test.

### **Data Validation and Reporting**

All chemical and bioassay data results will be validated. The data obtained from this task will be included in the Navy Bank Characterization Report, presenting sampling methodology, analytical results of the field sampling (both chemistry and bioassay results), and Quality Assurance/Quality Control (QA/QC) summary. In addition to comparing the chemical concentrations with the SQOs and Sediment Management Standards (SMS) criteria (as stated in the original scope of work for the Navy Bank sediment characterization), the bioassay testing results will be compared to the SQO and SMS biological testing interpretation criteria.

## **References**

CRA. 2000. Work Plan and Sampling and Analysis Plan – Characterization of the Navy Bank Area. Phase 1 Hylebos Mouth Cleanup. Prepared for the Port of Tacoma and Occidental Chemical Corporation, Tacoma, Washington. Prepared by Conestoga-Rovers & Associates, Niagara Falls, New York. January 2000.

PSEP. 1986 as updated in 1989, 1991, 1995, and 1997. Recommended protocols for measuring selected environmental variables in Puget Sound. Prepared for the Puget Sound Estuary Program, U.S. Environmental Protection Agency, Region 10, Office of Puget Sound, Seattle, Washington.

## **Figures and Tables**

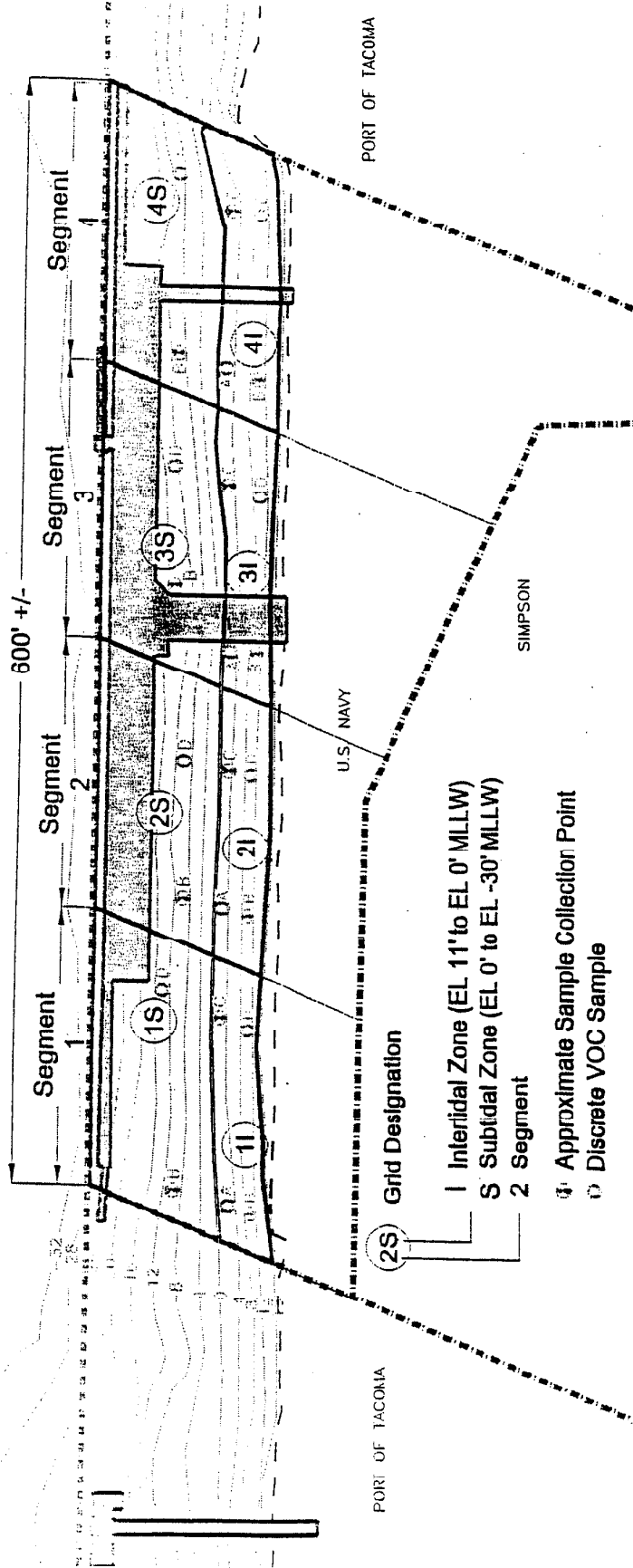


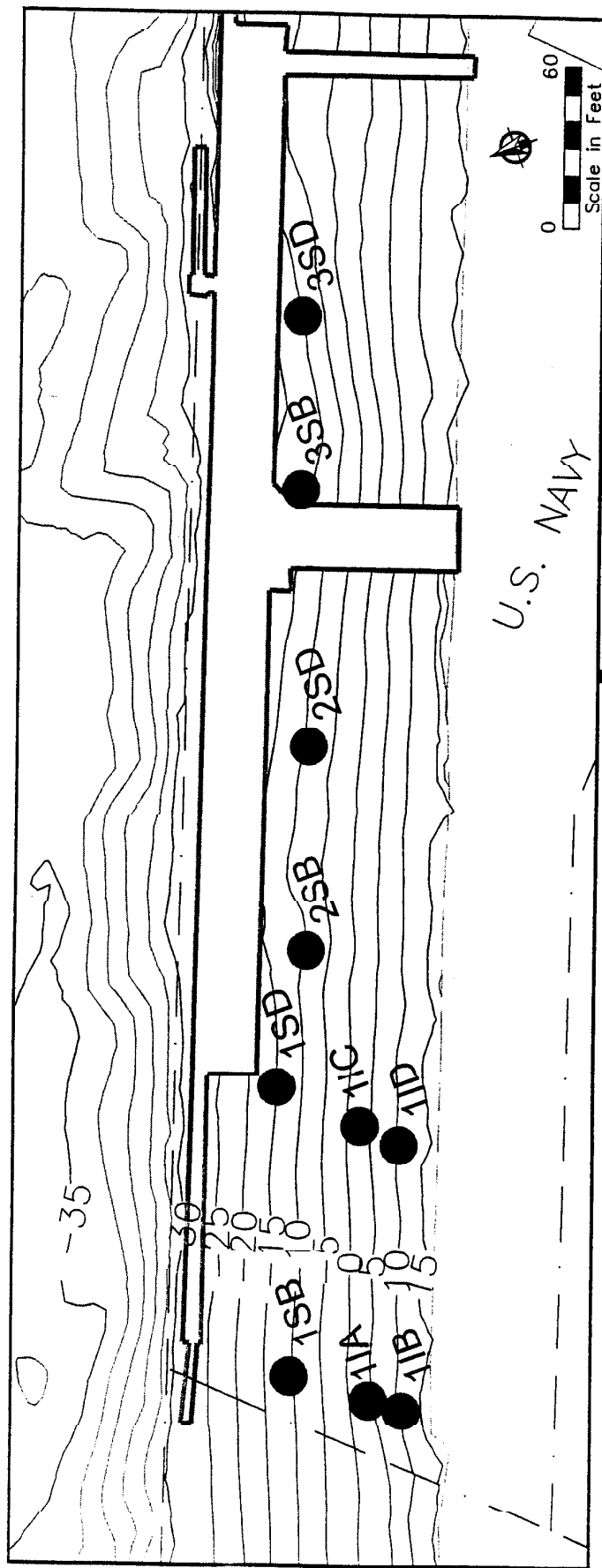
figure 1  
 PHASE I SAMPLING GRIDS  
 NAVY BANK SEDIMENT CHARACTERIZATION  
 Port of Tacoma/Occidental Chemical Corporation

**NOTE:**  
 THE ACTUAL LOCATIONS AND ELEVATIONS  
 OF SAMPLE COLLECTION POINTS WILL BE  
 PRESENTED IN THE CHARACTERIZATION REPORT.

**SOURCES:**  
 ANCHOR  
 ENVIRONMENTAL, L.L.C.  
 Geotechnical Engineers  
 CRA



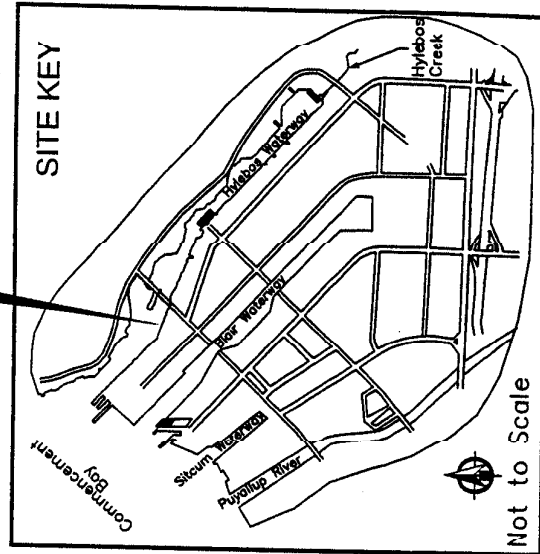




# MOUTH OF HYLEBOS WATERWAY AREA

## LEGEND

- Stations to be Resampled



## Notes:

- 1) All elevations shown are referenced to Mean Lower Low Water = 0.0' (Part of Tacoma) based on the Tacoma Public Works Dept. datum chart dated January 1, 1992 and based upon NOAA Publication dated 9/19/85, for Tacoma, Commencement Bay.
- 2) Bathymetric contours for Hylebos Waterway derived from hydrographic surveys performed by Blue Water Engineering in June 1993, March 1994 and June 1998.



08/27/01 GSH002-02.DWG 0004909

Figure 2  
Navy Bank Sediment Characterization  
Phase 2 Sample Locations

Table 1. Station Coordinates (NAD 27)

Station ID	Northing	Easting
1IA	714917.406	1528745.031
1IB	714907.276	1528736.964
1IC	714884.731	1528840.993
1ID	714873.733	1528829.373
1SB	714941.710	1528763.473
1SD	714908.488	1528865.407
2SB	714880.569	1528908.982
2SD	714852.849	1528981.070
3SB	714822.248	1529071.502
3SD	714799.003	1529132.022

Table 2. Sample Compositing Scheme

Segment No.	Intertidal/Subtidal	Station No.	Composite Sample ID
1	Intertidal	1IA, 1IB, 1IC, 1ID	SE-sample date-KAM-033
1	Subtidal	1SB, 1SD	SE-sample date-KAM-034
2	Subtidal	2SB, 2SD	SE-sample date-KAM-035
3	Subtidal	3SB, 3SD	SE-sample date-KAM-036

percentage of breakdown. All associated 4,4'-DDT, 4,4'-DDD, and 4,4'-DDE results were qualified according to the guidelines (see Table 6).

#### Metals - Inductively Coupled Plasma (ICP) - Atomic Emission Spectrometer

Calibration curves and initial calibration verification (ICV) and continuing calibration verification (CCV) standards were analyzed at the proper frequency.

The calibration curves were acceptable and all ICV and CCV recoveries associated with the samples were within the required control limits.

Standards were analyzed at the Contract Required Detection Limit (CRDL) and all recoveries were acceptable with the exception of a high silver recovery. All associated silver results with concentrations similar to the CRDL were qualified as estimated to reflect the implied high bias (see Table 7).

#### Mercury - Atomic Absorption Spectrometer (AA)

All calibration curves met the acceptance criteria and all ICV and CCV recoveries associated with the samples were within the required control limits.

#### General Chemistry - TOC

All calibrations were performed as required by the methods. Initial and continuing calibration verification standards were analyzed at the proper frequency and the results were acceptable.

#### INTERNAL STANDARD RECOVERIES - GC/MS ANALYSES

The proper internal standard (IS) compounds were added to all samples, blanks, standards, and spike samples prior to VOC and SVOC analyses. All IS recoveries were acceptable and all result calculations were correctly performed.

#### SURROGATE COMPOUND ANALYSES - ORGANICS

Surrogate compounds were added to all samples, blanks, and OC samples prior to extraction and/or analysis.

All surrogate recoveries met the method specified acceptance criteria, indicating adequate analytical efficiency.

#### METHOD BLANK ANALYSES

Method blanks were analyzed and/or extracted at the proper frequency for all parameters.

All method blank results were non-detect with the exception of bis(2-ethylhexyl)phthalate present at low concentrations. All associated results were significantly greater than the concentrations in the blank and would not have been affected.

#### MATRIX SPIKE/MATRIX SPIKE DUPLICATE ANALYSES

Matrix spikes (MS) were prepared and analyzed (in duplicate for organics) at the proper frequency.

Most spike recoveries showed acceptable analytical accuracy and precision with the following exceptions:

- i) the MS analysis of sample SE-021600-JSV-019 yielded an extremely low antimony recovery. All associated sample results were non-detect and rejected due to the poor analyte efficiency (see Table 8); and
- ii) variability was observed between the 4,4'-DDT recoveries. The sample results for 4,4'-DDT were qualified as estimated to reflect the implied variability (see Table 9).

#### LABORATORY CONTROL SAMPLE (LCS) ANALYSES

LCS samples were prepared and analyzed with each batch of samples. All LCS samples were acceptable, demonstrating good analytical accuracy.

#### DUPLICATE ANALYSES - METALS AND TOC

Duplicate samples were prepared at the proper frequency.

All duplicate analyses were acceptable with the exception of variability between the original and duplicate analyses of sample SE-021600-JSV-019 for chromium and nickel. All associated positive sample results were qualified as estimated to reflect the implied variability (see Table 10).

#### ICP SERIAL DILUTION

Sample SE-021600-JSV-019 was analyzed as a serial dilution sample and all analyses met the acceptance criteria.

#### FIELD BLANK ANALYSES

One rinse blank and one trip blank were collected and submitted to the laboratory for analysis. All results were non-detect except for bis(2-ethylhexyl)phthalate, present at low concentrations. All associated sample results with similar concentrations were qualified as non-detect (see Table 11).

#### FIELD DUPLICATE ANALYSES

Sample SE-021600-JSV-020 was collected in duplicate and submitted "blind" to the laboratory. The analytical results showed acceptable analytical and sampling precision with the exception of variability observed between some SVOC and metals results. The sample and its field duplicate (SE-021600-JSV-026) were qualified as estimated for these compounds (see Table 12).

#### GENERAL COMMENTS

At the client's request, sample SE-021600-JSV-018 was reanalyzed for nickel and copper. The reanalysis showed a difference of 25 percent between the copper results and a difference of 5 percent between the nickel results. Based on the minor differences, the original results were reported.

Samples SE-021600-JSV-019, SE-021700-JSV-029, and SE-021700-JSV-030 exhibited 4,4'-DDD results at levels above the SOO. Based on historical data, it is known that interferences can cause false detections of DDD in this matrix. Therefore, the samples were submitted to DMD, Inc, located in Vashan, WA, for analysis of dichlorodiphenyldichloroethane (DDD) by

Selective Ion Monitoring (SIM). The SIM analytical data are presented in Table 2c and were qualified as estimated due to a low spectral match.

### 3.0 CONCLUSION

Based on the preceding assessment of the analytical data provided, these results are acceptable with the qualifications and exceptions noted.

APPENDIX A

CHAIN OF CUSTODY DOCUMENTS



## TABLES

**TABLE 1**  
**SAMPLE SUMMARY**  
**SEDIMENT CHARACTERIZATION**  
**HYLEBOS MOUTH CLEANUP**  
**FEBRUARY 2000**

Sample ID	Sample Location	Sample Date	Sample Time	Analyses Sample Set	Comments
SE-021600-JSV-001	11A	02/17/00	19:45	SSPL VOCs	
SE-021600-JSV-002	11D	02/17/00	20:10	SSPL VOCs	
SE-021600-JSV-018	Composite of 11a, 11b, 11c, and 11d	02/17/00	19:45	SSPL SVOCs, SSPL Metals, SSPL Pest/PCBs, TOC	
SE-021600-JSV-003	21A	02/17/00	20:20	SSPL VOCs	MS/NSD
SE-021600-JSV-004	21D	02/17/00	20:40	SSPL VOCs	
SE-021600-JSV-019	Composite of 21a, 21b, 21c, and 21d	02/17/00	20:20	SSPL SVOCs, SSPL Metals, SSPL Pest/PCBs, TOC	MS/NSD
SE-021600-JSV-005	31A	02/17/00	20:50	SSPL VOCs	
SE-021600-JSV-006	31D	02/17/00	21:00	SSPL VOCs	
SE-021600-JSV-017	31D	02/17/00	12:00	SSPL VOCs	Dup of 006
SE-021600-JSV-020	Composite of 31a, 31b, 31c, and 31d	02/17/00	20:50	SSPL SVOCs, SSPL Metals, SSPL Pest/PCBs, TOC	
SE-021600-JSV-026	Composite of 31a, 31b, 31c, and 31d	02/17/00	12:00	SSPL SVOCs, SSPL Metals, SSPL Pest/PCBs, TOC	Dup of 020
SE-021600-JSV-007	41A	02/17/00	21:15	SSPL VOCs	
SE-021600-JSV-008	41D	02/17/00	21:30	SSPL VOCs	
SE-021600-JSV-021	Composite of 41a, 41b, 41c, and 41d	02/17/00	21:15	SSPL SVOCs, SSPL Metals, SSPL Pest/PCBs, TOC	
SE-021700-JSV-016	1SD	02/18/00	13:45	SSPL VOCs	
SE-021700-JSV-029	Composite of 1SD and 1SD	02/18/00	13:45	SSPL SVOCs, SSPL Metals, SSPL Pest/PCBs, TOC	
SE-021700-JSV-015	2SD	02/18/00	13:30	SSPL VOCs	
SE-021700-JSV-030	Composite of 2SD and 2SD	02/18/00	13:30	SSPL SVOCs, SSPL Metals, SSPL Pest/PCBs, TOC	
SE-021700-JSV-014	3SD	02/18/00	16:00	SSPL VOCs	
SE-021700-JSV-031	Composite of 3SD and 3SD	02/18/00	15:45	SSPL SVOCs, SSPL Metals, SSPL Pest/PCBs, TOC	
SE-021700-JSV-013	4SD	02/18/00	15:00	SSPL VOCs	
SE-021700-JSV-032	Composite of 4SD and 4SD	02/18/00	15:30	SSPL SVOCs, SSPL Metals, SSPL Pest/PCBs, TOC	
RB-021600-JSV-027	-	02/17/00	18:00	SSPL VOCs	Rinse Blank
RB-021700-JSV-028	-	02/18/00	9:00	SSPL VOCs	Rinse Blank
Trip Blank	-	02/19/00	-	SSPL VOCs	Trip Blank

Notes:

PCB Polychlorinated Biphenols  
Pest Pesticides  
SSPL Site-Specific Parameter List  
SVOC Semi-Volatile Organic Compound.  
TOC Total Organic Carbon  
VOC Volatile Organic Compounds

TABLE 2a

ANALYTICAL RESULTS SUMMARY  
SEDIMENT CHEMISTRY CHARACTERIZATION - VOLATILES  
HYLEBOS MOUTH CLEANUP  
NAVY BANK  
FEBRUARY 2000

Parameter	Unit	11a	11d	1Sd	21a	21d	2Sd	31a
Sample Location: SE-021600-JSV-001 SE-021600-JSV-002 SE-021700-JSV-016 SE-021600-JSV-003 SE-021600-JSV-004 SE-021700-JSV-015 SE-021600-JSV-005								
Sample Date: 2/16/2000 2/16/2000 2/17/2000 2/16/2000 2/16/2000 2/16/2000 2/17/2000 2/16/2000								
Volatiles								
Ethylbenzene	ug/Kg	1 U	1 U	1.4 U	1.1 U	1 U	1.2 U	1.1 U
m&p-Xylene	ug/Kg	1 U	1 U	1.4 U	1.1 U	1 U	1.2 U	1.1 U
o-Xylene	ug/Kg	1 U	1 U	1.4 U	1.1 U	1 U	1.2 U	1.1 U
Tetrachloroethene	ug/Kg	1 U	1 U	1.4 U	1.1 U	1 U	1.2 U	1.1 U
Trichloroethene	ug/Kg	1 U	1 U	1.4 U	1.1 U	1 U	1.2 U	1.1 U

Parameter	Unit	31d	3Sd	41a	41d	4Sd
Sample Location: SE-021600-JSV-006 SE-021600-JSV-017 SE-021700-JSV-014 SE-021600-JSV-007 SE-021600-JSV-008 SE-021700-JSV-013						
Sample Date: 2/16/2000 2/16/2000 2/17/2000 2/16/2000 2/16/2000 2/17/2000						
Volatiles						
Ethylbenzene	ug/Kg	1 U	1 U	1.1 U	1 U	0.9 U
m&p-Xylene	ug/Kg	1 U	1 U	1.1 U	1 U	0.9 U
o-Xylene	ug/Kg	1 U	1 U	1.1 U	1 U	0.9 U
Tetrachloroethene	ug/Kg	1 U	1 U	1.1 U	1 U	0.9 U
Trichloroethene	ug/Kg	1 U	1 U	1.1 U	1 U	0.9 U

Notes:

U Non-detect at associated value.

TABLE 2b

ANALYTICAL RESULTS SUMMARY  
SEDIMENT CHEMISTRY CHARACTERIZATION - NON-VOLATILES  
HYLEBOS MOUTH CLEANUP  
NAVY BANK  
FEBRUARY 2000

Sample Location:	11a, 11b, 11c, 11d Comp	15b, 15d Comp	21a, 21b, 21c, 21d Comp	25b, 25d Comp	31a, 31b, 31c, 31d Comp	35b, 35d Comp	41a, 41b, 41c, 41d Comp	45b, 45d Comp
Sample ID:	SE-021600-JSV-018	SE-021700-JSV-029	SE-021700-JSV-019	SE-021700-JSV-030	SE-021600-JSV-020	SE-021600-JSV-026	SE-021600-JSV-021	SE-021700-JSV-032
Sample Date:	2/16/2000	2/17/2000	2/16/2000	2/17/2000	2/16/2000	2/16/2000	2/16/2000	2/17/2000
Parameter	Unit	Unit	Unit	Unit	Unit	Unit	Unit	Unit
<b>Semi-Volatiles</b>								
1,2,4-Trichlorobenzene	ug/Kg	37 U	19 U	20 U	19 U	19 U	19 U	19 U
1,2-Dichlorobenzene	ug/Kg	37 U	19 U	20 U	19 U	19 U	19 U	19 U
1,3-Dichlorobenzene	ug/Kg	37 U	19 U	20 U	19 U	19 U	19 U	19 U
1,4-Dichlorobenzene	ug/Kg	37 U	19 U	20 U	19 U	19 U	19 U	19 U
2,4-Dimethylphenol	ug/Kg	37 U	19 U	20 U	19 U	19 U	19 U	19 U
2-Methyl naphthalene	ug/Kg	37 U	68	20 U	27	24	85	19 U
2-Methylphenol	ug/Kg	37 U	19 U	20 U	19 U	19 U	19 U	19 U
4-Nitrophenol	ug/Kg	37 U	19 U	20 U	19 U	19 U	19 U	19 U
Acenaphthene	ug/Kg	120	890	20 U	19 U	19 U	19 U	19 U
Acenaphthylene	ug/Kg	78	57	46	40	33	29	24
Anthracene	ug/Kg	280	320	120	53	84	44	72
Benzo(a)anthracene	ug/Kg	390	460	300	160	200	83	190
Benzo(a)pyrene	ug/Kg	690	540	840	410	680	230	610
Benzo(b)fluoranthene	ug/Kg	1300	790	490	490	810	270	560
Benzo(g,h,i)perylene	ug/Kg	430 J	210	260 J	800 J	1600 J	540	1200
Benzo(k)fluoranthene	ug/Kg	790	600	430	420 J	570 J	210 J	180
Benzoic acid	ug/Kg	370 U	190 U	200 U	680	1000	300	760
Benzyl Alcohol	ug/Kg	37 U	19 U	20 U	190 U	190 U	190 U	190 U
bis(2-ethylhexyl)phthalate	ug/Kg	260	230	380	130 U	110 U	97 U	19 U
Butyl benzylphthalate	ug/Kg	37 U	19 U	58	38	40	27	19 U
Chrysene	ug/Kg	710	740	490	800 J	1500 J	540	1100
Dibenz(a,h)anthracene	ug/Kg	95	54	48	88	130	43	55 J
Dibenzofuran	ug/Kg	64	500	20 U	24	21	19	25
Diethyl phthalate	ug/Kg	37 U	19 U	20 U	19 U	19 U	19 U	19 U
Dimethyl phthalate	ug/Kg	37 U	19 U	20 U	19 U	19 U	19 U	19 U
Di-n-butylphthalate	ug/Kg	37 U	19 U	30	19 U	32	19 U	19 U
Di-n-octyl phthalate	ug/Kg	37 U	19 U	20 U	19 U	19 U	19 U	19 U
Fluoranthene	ug/Kg	1900	810	610	950 J	2100 J	930	2300
Fluorene	ug/Kg	110	610	22	47	50	34	75
Hexachlorobenzene	ug/Kg	25 U	18 U	15	4.7 U	2.5	2.3	0.96 U
Hexachlorobutadiene	ug/Kg	1.8	5.6	3.8	0.89 U	0.89 U	0.88 U	1.1
Hexachloroethane	ug/Kg	37 U	26	20 U	19 U	19 U	19 U	19 U
Indene(1,2,3-cd)pyrene	ug/Kg	420	240	260	430	600	210	210
Naphthalene	ug/Kg	82	600	20 U	18 J	19 U	50	19 U
<b>Semi-Volatiles (Cont'd)</b>								
N-Nitrosodiphenylamine	ug/Kg	37 U	19 U	20 U	19 U	19 U	19 U	19 U
Pentachlorophenol	ug/Kg	190 U	97 U	100 U	96 U	96 U	95 U	96 U
Phenanthrene	ug/Kg	820	1200	210	500	690	420	1200
Phenol	ug/Kg	37 U	790	20 U	19 U	56 M	19 U	38 M
Pyrene	ug/Kg	960	790	480	1100	1200	920	1800

Metals

TABLE 2b

ANALYTICAL RESULTS SUMMARY  
SEDIMENT CHEMISTRY CHARACTERIZATION - NON-VOLATILES  
LYLEBOS MOUTH CLEANUP  
NAVY BANK  
FEBRUARY 2000

Sample Location: 1A, 1B, 1C, 1d Comp		1Sb, 1Sd Comp	2A, 2B, 2C, 2d Comp	3A, 3B, 3C, 3d Comp	3A, 3B, 3C, 3d Comp	3Sb, 3Sd Comp	4A, 4B, 4C, 4d Comp	4Sb, 4Sd Comp
Sample ID: SE-021600-JSV-018		SE-021700-JSV-029	SE-021600-JSV-019	SE-021700-JSV-030	SE-021600-JSV-020	SE-021700-JSV-031	SE-021600-JSV-021	SE-021700-JSV-012
Sample Date: 2/16/2000		2/17/2000	2/16/2000	2/17/2000	2/16/2000	2/17/2000	2/16/2000	2/17/2000
Parameter	Unit	Duplicate						
Antimony	mg/kg	R	R	R	R	R	R	R
Arsenic	mg/kg	10	9	13	6	6	7	10
Cadmium	mg/kg	0.4	0.3	0.3	0.2 U	0.3	0.3 U	0.3
Chromium	mg/kg	2260 J	2250 J	154 J	2350 J	1880 J	2610 J	81.8 J
Copper	mg/kg	549	61.6	72.7	32.5	34.1	25.7	45.4
Lead	mg/kg	77	59	84	33	41	28	38
Mercury	mg/kg	0.15	0.11	0.13	0.04	0.09	0.04	0.08
Nickel	mg/kg	203 J	254 J	21 J	35 J	37.4 J	40 J	18.1 J
Silver	mg/kg	0.4 U	0.3 J	0.3 J	0.4 U	0.2 U	0.4 U	0.2 U
Zinc	mg/kg	127	86.9	128	106 J	65.9	62.6	82.9
<b>Pesticides/PCBs</b>								
4,4'-DDE	ug/kg	10 U	30 NJ	22 NJ	3.9 U	4.6 NJ	1.8 U	3.4 U
4,4'-DDE	ug/kg	1.7 U	7.1 U	19 U	1.8 U	1.9 U	1.8 U	1.9 U
4,4'-DDT	ug/kg	9.4 J	8.4 J	R	6.8 J	4.5 J	3.9 J	1.9 U
Aldrin	ug/kg	0.87 U	0.97 U	0.95 U	0.89 U	0.89 U	0.88 U	0.96 U
alpha-Chlordane	ug/kg	3 U	2.1 U	1.5 U	0.94 U	0.89 U	0.88 U	0.96 U
Aroclor 1016	ug/kg	17 U	19 U	16 U	18 U	18 U	18 U	19 U
Aroclor 1221	ug/kg	35 U	39 U	38 U	36 U	39 U	35 U	38 U
Aroclor 1232	ug/kg	17 U	19 U	16 U	18 U	19 U	19 U	19 U
Aroclor 1242	ug/kg	110 U	120 U	91 U	29 U	30 U	19 U	35 U
Aroclor 1248	ug/kg	120 U	120 U	160 U	61 U	34 U	22 U	83 U
Aroclor 1254	ug/kg	150 U	320 U	280 U	18 U	43 U	21 U	21 U
Aroclor 1260	ug/kg	89 U	140 U	100 U	40 U	76 U	22 U	83 U
Dieldrin	ug/kg	5 U	8.3	95 U	40 U	59 U	21 U	44 U
gamma-BHC (lindane)	ug/kg	3.3 U	2.8 J	4	1.8 U	1.9 U	1.8 U	1.9 U
gamma-Chlordane	ug/kg	14 U	31 U	38 U	0.89 U	0.96 U	0.88 U	0.96 U
Heptachlor	ug/kg	1.7 U	2 U	0.95 U	1.7 U	24 U	1.3 U	16 U
					0.89 U	0.96 U	0.88 U	0.96 U
<b>General Chemistry</b>								
Total Organic Carbon (TOC)	%	2.3	1.7	2.5	1.5	1.3	1.2	1.6
Total Solids	%	81.4	64.6	55.1	78.4	72.4	74.6	66.3

Notes:

- Not applicable.

J - Estimated.

R - Rejected.

U - Non-detect at associated value.

R - Rejected.  
U - Non-detect at associated value.  
J - Estimated.

TABLE 2c  
ANALYTICAL RESULTS SUMMARY  
SEDIMENT CHEMISTRY CHARACTERIZATION - DDD FROM SIM  
HYLEBOS MOUTH CLEANUP  
NAVY BANK  
FEBRUARY 2000

	Sample ID:	SE-021600-JSV-019	SE-021700-JSV-029	SE-021700-JSV-030
	Location ID:	11a, 11b, 11c, 11d comp	1sb and 1sd comp	2sb and 2sd comp
	Collection Date:	02/16/00	02/17/00	02/17/00
Pesticides	Units			
4,4'-DDD	µg/Kg	1.9 U	4.2 J	3 J

Notes:

- Comp Composite sample collected.
- DDD Dichlorodiphenyldichloroethane.
- J Associated value is estimated.
- SIM Selection Ion Monitoring.
- U Non-detect at associated value.

TABLE 3

**ANALYTICAL METHODS, SAMPLE PRESERVATION, AND HOLDING TIME CRITERIA**  
**SEDIMENT CHARACTERIZATION**  
**HYLEBOS MOUTH CLEANUP**  
**FEBRUARY 2000**

<i><b>Analyses</b></i>	<i><b>Analytical Method <sup>(1)</sup></b></i>	<i><b>Preservation</b></i>	<i><b>Maximum Holding Time</b></i>
SSPL VOCs	SW-846 8250	Cool 4°C	14 days from collection to analysis
SSPL SVOCs	SW-846 8270	Cool 4°C	14 days from collection to preparatory extraction 40 days from preparatory extraction to analysis
SSPL Pesticides/PCBs	SW-846 8081, 8082	Cool 4°C	14 days from collection to preparatory extraction 40 days from preparatory extraction to analysis
SSPL Metals (Except Mercury)	SW-846 6010	Cool 4°C	180 days from collection to analysis
Mercury	SW-846 7041	Cool 4°C	28 days from collection to analysis
TOC	SW-846 9060	Cool 4°C	28 days from collection to analysis

## Notes:

- (1) "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods", SW-846, 3rd Edition, 1986 (with revisions).
- PCBs Polychlorinated Biphenyl.
- SSPL Site-Specific Parameter List.
- SVOCs Semi-Volatile Organic Compound.
- TAL Target Analyte List.
- TCL Target Compound List.
- TOC Total Organic Compound.
- VOCs Volatile Organic Compound.

TABLE 4

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING CONTINUING CALIBRATION RESULTS  
 SEDIMENT CHARACTERIZATION  
 HYLEBOS MOUTH CLEANUP  
 FEBRUARY 2000

Parameter	Calibration Date	Compound	%D	Associated Sample ID	Sample Results	Units	Qualifier
Pesticides	03/08/00	4,4'-DDD	20	SE-021600-JSV-019	24	µg/Kg	J
				SE-021700-JSV-029	30	µg/Kg	J
				SE-021700-JSV-030	22	µg/Kg	J
				SE-021700-JSV-031	4.6	µg/Kg	J
Pesticides	03/08/00	4,4'-DDT	16	SE-021600-JSV-018	9.4	µg/Kg	J
				SE-021600-JSV-019	2.7 U	µg/Kg	J
				SE-021600-JSV-020	6.8	µg/Kg	J
				SE-021600-JSV-021	3.9	µg/Kg	J
				SE-021600-JSV-026	4.6	µg/Kg	J
				SE-021700-JSV-029	8.6	µg/Kg	J
				SE-021700-JSV-030	1.9 U	µg/Kg	J
				SE-021700-JSV-031	4.5	µg/Kg	J
				SE-021700-JSV-032	1.9 U	µg/Kg	J
SVOCs	03/01/00	Benzo(g,h,i)perylene	30	SE-021600-JSV-018	430	µg/Kg	J
				SE-021600-JSV-019	260	µg/Kg	J
				SE-021600-JSV-020	420	µg/Kg	J
				SE-021600-JSV-021	210	µg/Kg	J
				SE-021600-JSV-026	570	µg/Kg	J
				SE-021700-JSV-029	210	µg/Kg	J
				SE-021700-JSV-030DL	270	µg/Kg	J
				SE-021700-JSV-031	500	µg/Kg	J
				SE-021700-JSV-032	180	µg/Kg	J

## Notes

%D Percent Difference.

J Estimated.

SVOCs Semi-Volatile Organic Compounds.

U Non-detect at the associated value.



TABLE 5

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING INITIAL CALIBRATION RESULTS  
SEDIMENT CHARACTERIZATION  
HYLEROS MOUTH CLEANUP  
FEBRUARY 2000

<i>Parameter</i>	<i>Compound</i>	<i>Calibration Date</i>	<i>Associated Sample ID</i>	<i>%RSD</i>	<i>Sample Results</i>	<i>Units</i>	<i>Qualifier</i>
Pesticides	4,4'-DDD	02/02/00	SE-021700-JSV-031	25	4.6	µg/Kg	J

Notes:

J Estimated.

%RSD: Percent Relative Standard Deviation.

TABLE 6

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING DEGRADATION RESULTS  
 SEDIMENT CHARACTERIZATION  
 HYLEBOS MOUTH CLEANUP  
 FEBRUARY 2000

Parameter	Calibration Date	Compound	%Deg	Associated Sample ID	Compound	Sample Results	Units	Qualifier
Pesticides	03/09/00	4,4'-DDT	59	SE-021600-JSV-018	4,4'-DDT	9.4	µg/Kg	J
					4,4'-DDT	2.7 U	µg/Kg	R
				SE-021600-JSV-019	4,4'-DDD	24	µg/Kg	NJ
					4,4'-DDT	8.6	µg/Kg	J
				SE-021700-JSV-029	4,4'-DDD	30	µg/Kg	NJ
					4,4'-DDT	1.9 U	µg/Kg	R
				SE-021700-JSV-030	4,4'-DDD	22	µg/Kg	NJ
					4,4'-DDT	4.5	µg/Kg	J
				SE-021700-JSV-031	4,4'-DDD	4.6	µg/Kg	NJ

## Notes:

%Deg Percent degradation.

J Estimated.

NJ Presumptively present at the associated estimated value.

R Rejected.

U Non-detect at the associated value.

TABLE 7

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING CRDL RECOVERIES  
 SEDIMENT CHARACTERIZATION  
 HYLEBOS MOUTH CLEANUP  
 FEBRUARY 2000

<i>Parameter</i>	<i>Analyte</i>	<i>CRDL Recovery (Percent)</i>	<i>Control Limits</i>	<i>Sample ID</i>	<i>Sample Result</i>	<i>Units</i>	<i>Qualifier</i>
Metals	Silver	148	70-130	SE-021700-JSV-029	0.3	mg/Kg	J
				SE-021700-JSV-030	0.3	mg/Kg	J

## Notes:

CRDL Contract Required Detection Limit.

J Associated value is estimated.

**TABLE 8**  
**QUALIFIED SAMPLE DATA DUE TO OUTLYING SPIKE RECOVERIES**  
**SEDIMENT CHARACTERIZATION**  
**HYLEBOS MOUTH CLEANUP**  
**FEBRUARY 2000**

<i>Analyte</i>	<i>Spike Recovery (Percent)</i>	<i>Control Limits (Percent)</i>	<i>Associated Samples</i>	<i>Sample Results</i>	<i>Qualifier</i>	<i>Units</i>
Antimony	12	75-125	SE-021500-JSV-018	6 U	R	mg/Kg
			SE-021500-JSV-019	7 U	R	mg/Kg
			SE-021500-JSV-020	6 U	R	mg/Kg
			SE-021600-JSV-021	6 U	R	mg/Kg
			SE-021600-JSV-026	6 U	R	mg/Kg
			SE-021700-JSV-029	4 U	R	mg/Kg
			SE-021700-JSV-030	5 U	R	mg/Kg
			SE-021700-JSV-031	4 U	R	mg/Kg
			SE-021700-JSV-032	4 U	R	mg/Kg

Note:

R Data rejected.

U Non-detected at associated value.

TABLE 9

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES  
 SEDIMENT CHARACTERIZATION  
 HYLEBOS MOUTH CLEANUP  
 FEBRUARY 2000

<i>Parameter</i>	<i>Sample ID</i>	<i>Analyte</i>	<i>MS Recovery (Percent)</i>	<i>MSD Recovery (Percent)</i>	<i>RPD (Percent)</i>	<i>Sample Result</i>	<i>Units</i>	<i>Qualifier</i>
Pesticides	SE-021600-JSV-019	4,4'-DDT	51	141	94	2.7 U	µg/Kg	J

## Notes:

- J Estimated.
- MS Matrix Spike.
- MSD Matrix Spike Duplicate.
- RPD Relative Percent Difference.
- U Non-detect at the associated value.

TABLE 10

QUALIFIED SAMPLE DATA DUE TO POOR LABORATORY DUPLICATE PRECISION  
 SEDIMENT CHARACTERIZATION  
 HYLEBOS MOUTH CLEANUP  
 FEBRUARY 2000

Analyte	Sample ID	Original Result	Duplicate Result	RPD	Control Limit	Associated Sample IDs	Sample Results	Qualifier	Units
Chromium	SE-021600-JSV-019	2250	4250	62	35	SE-021600-JSV-018	2260	J	mg/Kg
						SE-021600-JSV-019	2250	J	mg/Kg
						SE-021600-JSV-020	2350	J	mg/Kg
						SE-021600-JSV-021	2610	J	mg/Kg
						SE-021600-JSV-026	2510	J	mg/Kg
						SE-021700-JSV-029	555	J	mg/Kg
						SE-021700-JSV-030	154	J	mg/Kg
						SE-021700-JSV-031	1880	J	mg/Kg
						SE-021700-JSV-032	81.8	J	mg/Kg
Nickel	SE-021600-JSV-019	64	101	45	35	SE-021600-JSV-018	203	J	mg/Kg
						SE-021600-JSV-019	64	J	mg/Kg
						SE-021600-JSV-020	35	J	mg/Kg
						SE-021600-JSV-021	40	J	mg/Kg
						SE-021600-JSV-026	69	J	mg/Kg
						SE-021700-JSV-029	25.4	J	mg/Kg
						SE-021700-JSV-030	21	J	mg/Kg
						SE-021700-JSV-031	37.4	J	mg/Kg
						SE-021700-JSV-032	18.1	J	mg/Kg

## Notes:

- J Associated value is estimated.  
 RPD Relative Percent Difference.

TABLE II

QUALIFIED SAMPLE RESULTS DUE TO ANALYTE CONCENTRATIONS IN THE RINSE BLANKS  
 SEDIMENT CHARACTERIZATION  
 HYLEBOS MOUTH CLEANUP  
 FEBRUARY 2000

Parameter	Rinse Blank Date	Analyte	Blank Result	Sample ID	Sample Result	Qualified Sample Result	Units
SVOCs	02/17/00	bis(2-Ethylhexyl)phthalate	2.	SE-021600JSV-020	130	130 U	$\mu\text{g/Kg}$
				SE-021600JSV-021	97	97 U	$\mu\text{g/Kg}$
				SE-021600JSV-026	110	110 U	$\mu\text{g/Kg}$
				SE-021700JSV-032	180	180 U	$\mu\text{g/Kg}$

## Notes:

SVOCs Semi-Volatile Organic Compounds.

U Non-detect at associated value.

TABLE 12

QUALIFIED SAMPLE DATA DUE TO VARIABILITY IN FIELD DUPLICATE RESULTS  
 SEDIMENT CHARACTERIZATION  
 HY/LEROS MOUTH CLEANUP  
 FEBRUARY 2000

Parameter	Analyte	Original		Duplicate		RPD	Units	Qualifier
		Sample ID	Result	Sample ID	Result			
SVOCs	Benzo(b)fluoranthene Chrysene Fluoranthene	SE-021600-JSV-020	800	SE-021600-JSV-026	1600	67	µg/Kg	J
		SE-021600-JSV-020	800	SE-021600-JSV-026	1500	61	µg/Kg	J
		SE-021600-JSV-020	950	SE-021600-JSV-026	2100	75	µg/Kg	J
Metals	Nickel Zinc	SE-021600-JSV-020	35	SE-021600-JSV-026	69	65	mg/Kg	J
		SE-021600-JSV-020	106	SE-021600-JSV-026	58.1	58	mg/Kg	J

## Notes:

J Associated value is estimated.

RPD Relative Percent Difference.

SVOCs Semi-Volatile Organic Compounds.



**APPENDIX D**  
**Phase 2 Chemistry Data Validation Report**

# Data Validation and Data Quality Assessment Report

## Characterization of the Navy Bank Area Round 2 Phase 1 Hylebos Mouth Cleanup Project Number: 99-049-09(1)

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## 1.0 Introduction

This report describes the QA2 data validation of the samples listed in Table 1. The analyses, with the exception of pesticide/PCB fractionation cleanup and grain size, were performed by Analytical Resources, Incorporated, located in Seattle Washington. The grain size analyses were performed by Rosa Environmental and Geotechnical Laboratory (REGL), located in Seattle, Washington. High performance liquid chromatographic (HPLC) fractionation cleanup was performed by D.M.D., Inc., located in Vashon, Washington.

The validation was performed in accordance with the procedures established in the *Data Validation Guidance Manual for Selected Sediment Variables* (QA2 Guidance Manual) (PTI 1989). The *Contract Laboratory Program National Functional Guidelines for Inorganic and Organic Data Review* (Functional Guidelines) (USEPA 1994a and 1994b) were used for items not addressed in the QA2 Guidance Manual. Project detection limits, QC sample frequencies and data quality objectives (DQOs) are from the *Characterization of the Navy Bank Area Phase 1 Hylebos Mouth Cleanup Field Activities Report* (SAP) (CRA 2000) and the *Phase 1 - Hylebos Mouth Cleanup Characterization of the Navy Bank Area Round 2 - Bioassay Testing* memorandum (Anchor Environmental 2000). The criteria used to qualify data are taken from the SAP, the QA2 Guidance Manual, Functional Guidelines, the analytical methods, or the professional judgment of the validation chemist.

Sections 2 through 8 present the QA2 validation findings and Section 10 defines the data qualifiers. Section 9 evaluates the project data against the data quality objectives set forth in the SAP. Table 2 presents a summary of the qualified data. The original laboratory resubmissions have been placed in the data packages. Copies of the laboratory communications are presented in Appendix A. Data qualifier flags have been added to the sample data sheets in the Data Summary sections of the data packages.

The Anchor Data Table was modified to reflect the data changes and qualifiers prescribed in this report. When more than one result exists for a parameter, the result that most closely meets the SAP data quality requirements was used in the Data Table. The validation qualifiers were added to the laboratory flag column of the Data Table.

The laboratory electronic data deliverable (EDD) files were reviewed and compared to the hardcopy reports. Validation qualifiers were added to the laboratory EDD files. Corrections were made to the EDD files as specified in this report.

**Table 1**  
**Sample Data Reviewed**

Sample ID	Laboratory Sample ID	Matrix	SVOA	P/Aroclors	Fractionated DDD/Aroclors	Metals	Conventionals
SE060500MIIB 033	BS55A, BU62A, & EZ19A	Sediment	X	X	X	X	X
SE060500MIIB 034	BS55B	Sediment	X	X		X	X
SE060500MIIB 035	BS55C	Sediment	X	X		X	X
SE060500MIIB 036	BS55D, BU62D, & EZ19D	Sediment	X	X	X	X	X
SE060500MIIB	BS55E	Water	X	X		X	

SVOA: Semivolatile organics by Method 8270

P/Aroclors: Pesticides and Aroclors by Method 8081

Fractionated DDD/Aroclors: HPLC fractionation cleanup for 4,4'-DDD and Aroclor analyses

Metals: Metals by Method 6010 and mercury by Method 7471

Conventionals: Total solids by Method 160.3, total organic carbon by the Plumb Method (Plumb 1981), and grain size by the PSEP Method

## **2.0 Data Validation of Semivolatile Organics Analyses**

### **2.1 Custody, Preservation, Holding Times, and Completeness – Acceptable with Discussion**

All samples were extracted and analyzed within the required holding times. All samples were received intact and were properly preserved. The data packages are complete and contain all the information necessary to recreate the sample results.

The case narrative incorrectly states that the samples were re-extracted due to internal standard recovery problems. The samples were reanalyzed at a dilution to improve the internal standard recovery.

### **2.2 Instrument Tuning and Mass Calibration – Acceptable**

The tuning compound decafluorotriphenylphosphine was analyzed at the required frequency and all relative abundance values are within QA2 criteria.

### **2.3 Initial Calibration – Acceptable with Discussion**

Initial calibrations were analyzed at the required frequency and are correctly calculated. Except as noted below, the QA2 criteria of relative standard deviation (RSD) values less than 20 for nonpolar analytes and less than 30 for polar analytes, and relative response factors greater than 0.05, were met.

The RSD of hexachlorobutadiene in the initial calibration analyzed on instrument NT1 is above the QA2 criteria at 35.9%. Since hexachlorobutadiene was not detected in the associated samples, data qualifiers are not required.

### **2.4 Continuing Calibration – Acceptable with Qualifications**

Continuing calibration verifications (CCVs) were analyzed at the required frequency and are correctly calculated. Except as noted below, all percent difference values and relative response factors meet the QA2 criteria of less than 25% and greater than 0.05, respectively.

The percent difference value of benzo(b)fluoranthene in the CCV analyzed on 6-13-00 is above the QA2 criteria at 28.3%. Since the response decreased, benzo(b)fluoranthene results in the associated sample (SE060500MHB) has been qualified as estimated detection limit (UE).

The percent difference values of bis(2-ethylhexyl)phthalate and di-n-octylphthalate in the CCV analyzed on 6-14-00 are above the QA2 criteria at 32.7% and 45.0%, respectively. Since the responses increased, only positive results in the associated samples were qualified as estimated (E) as shown in the following table.

The percent difference values of di-n-butylphthalate, bis(2-ethylhexyl)phthalate, di-n-octylphthalate, and pyrene in the CCV analyzed on 6-16-00 are above the QA2 criteria (values

range from 26.4 to 54.9%). Since the responses increased, only positive results in the associated samples were qualified as estimated (E) as shown in the following table.

The percent difference value of terphenyl-d<sub>14</sub> in the CCV analyzed on 6-16-00 is above the QA2 criteria at 30.5%. Data qualifiers are not required because terphenyl-d<sub>14</sub> is a surrogate compound.

Sample ID	Analyte	Qualification	Quality Control Exceedance
SE060500MHB	Benzo(b)fluoranthene	UE	Percent difference > 25 (response decreased)
SE060500MHB 033 SE060500MHB 034 SE060500MHB 035	Bis(2-ethylhexyl)phthalate	E	Percent difference > 25 (response increased)
SE060500MHB 034 SE060500MHB 035 Dilution SE060500MHB 036 Dilution	Pyrene	E	Percent difference > 25 (response increased)

## 2.5 Blank Analyses – Acceptable with Discussion

### 2.5.1 Method Blanks

Method blanks were analyzed at the required frequency and target analytes were not detected above the reporting limit.

### 2.5.2 Field Blanks

Sample SE060500MHB was identified as a field blank. Phenol, 4-methylphenol, dimethylphthalate, diethylphthalate, and di-n-butylphthalate were detected in the field blank at 25, 1.2, 3.6, 34, and 1.3 ug/L, respectively. When the volume of sample collected (approximately 9 liters) is taken into account, the field blank concentrations are insignificant (i.e., less than 1/5<sup>th</sup> the sample concentrations). As specified in the QA2 Guidance Manual, the phenol, 4-methylphenol, dimethylphthalate, diethylphthalate, and di-n-butylphthalate results in the associated samples have been qualified B. Associated sample results have not been blank corrected.

Sample ID	Analyte	Qualification	Quality Control Exceedance
SE050600MHB 033 SE050600MHB 034 SE050600MHB 035 SE050600MHB 036	Phenol 4-methylphenol Dimethylphthalate Diethylphthalate Di-n-butylphthalate	B positive results	Analyte present in associated field blank

## 2.6 Surrogate Analyses – Acceptable with Discussion

Surrogate compounds were added to all samples, blanks, and QC samples as required and are correctly calculated. Except as noted below, all surrogate recovery values are within the laboratory's control limits.

The 2,4,6-tribromophenol recovery from the diluted analysis of sample SE050600MHB 033 and the terphenyl-d<sub>14</sub> recovery from sample SE050600MHB 036 are outside the laboratory control limits at 44.4% and 142%, respectively. Data qualifiers are not required because the other seven surrogates are acceptable.

## **2.7 Matrix Spike/Matrix Spike Duplicate Analyses – Acceptable with Discussion**

Except as noted below, MS/MSD analyses were performed at the required frequency, are correctly calculated, and all percent recovery and RPD values are within the SAP criteria.

The laboratory did not analyze a MS/MSD pair with the water sample. Data qualifiers are not required since the water sample is a field QC sample.

The pyrene recovery in the MS analysis of sample SE050600MHB 035 is below the SAP criteria at zero percent. The RPD value for pyrene is above the SAP criteria at 59.7%. The MS recovery and RPD value were both reported as NA (no recovery). Data qualifiers are not required because the sample result, MS result, and MSD result are above the calibration range. Ideally, the laboratory should have reanalyzed the MS and MSD at a dilution.

## **2.8 Laboratory Control Sample Analyses – Acceptable**

Laboratory control samples were analyzed with each batch. The results are correctly calculated and all percent recovery values are within the SAP criteria.

## **2.9 Certified Reference Material Analyses**

Certified reference material analyses are not required by the SAP and were not performed.

## **2.10 Internal Standard Evaluation – Acceptable with Qualifications**

Internal standards were added to all samples, blanks, and QC samples as required. Except as noted below, the recovery and retention time criteria of Functional Guidelines were met.

The internal standard recovery of perylene-d<sub>12</sub> from the original analyses of samples SE050600MHB 033 and SE050600MHB 035 are below the Functional Guidelines criteria of greater than 50% of the associated continuing calibration internal standard area. The results of the associated analytes have been rejected (qualified R) in favor of the dilution results.

The internal standard recovery of chrysene-d<sub>12</sub> and perylene-d<sub>12</sub> from the original analysis of sample SE050600MHB 036 are below Functional Guidelines criteria. The results of the associated analytes have been rejected (qualified R) in favor of the dilution results.

The internal standard recovery of perylene-d<sub>12</sub> from the MS and MSD analyses of sample SE050600MHB 035 are below Functional Guidelines criteria. Data qualifiers are not required for QC samples.

Sample ID	Analyte	Quality Control Exceedance	Qualification
SE050600MHB 033	Di-n-octylphthalate	Internal standard recovery of	R

Sample ID	Analyte	Quality Control Exceedance	Qualification
SE050600MHB 035	Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Indeno(1,2,3-cd)pyrene Dibenz(a,h)anthracene Benzo(g,h,i)perylene	perylene-d <sub>12</sub> below Functional Guidelines criteria	(in favor of dilution results)
SE050600MHB 036	Pyrene Butylbenzylphthalate Benzo(a)anthracene Bis(2-ethylhexyl)phthalate Chrysene Di-n-octylphthalate Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Indeno(1,2,3-cd)pyrene Dibenz(a,h)anthracene Benzo(g,h,i)perylene	Internal standard recovery of chrysene-d <sub>12</sub> and perylene-d <sub>12</sub> below Functional Guidelines criteria	R (in favor of dilution results)

## 2.11 Compound Quantitation and Laboratory Reporting Limits – Acceptable with Qualifications

The final results are correctly calculated including percent moisture, amount extracted, and dilution factors. Except as noted below, the QA2 relative retention time and mass spectral criteria were met.

The relative retention time of phenol in the sediment samples is outside the QA2 criteria of within 0.06 relative retention time units of the associated CCV standard. Data qualifiers are not required because the spectra meets the QA2 criteria and the phenol-d<sub>5</sub> surrogate relative retention times follow the same pattern.

The SAP target detection limits were met with one exception. The hexachlorobutadiene reporting limit is above the SAP target detection limit.

All the sediment samples were analyzed at a dilution due to high levels of target compounds or to enhance internal standard recovery. The laboratory reported one analysis data sheet for the original analysis and one for the dilution. To condense the results to one result per analyte per sample, results that are above the calibration range (laboratory E flag) have been rejected (qualified R). Results and elevated detection limits from the diluted analyses that are not necessary have also been rejected (qualified R).

Sample ID	Analyte	Qualification	Quality Control Exceedance
SE050600MHB 033 SE050600MHB 034 SE050600MHB 035 SE050600MHB 036	All analytes flagged E by the laboratory	R	Result above the calibration range



Sample ID	Analyte	Qualification	Quality Control Exceedance
SE050600MHB 033 Dilution SE050600MHB 034 Dilution SE050600MHB 035 Dilution SE050600MHB 036 Dilution	All analytes for which the dilution was not required	R	Unnecessary result or elevated detection limit

### 2.12 Field Duplicates

Field duplicates are not associated with this set of samples.

### 2.13 Overall Assessment of Data Useability

The useability of the data is based on the guidance documents listed above. Upon consideration of the information presented here, the data are acceptable except where flagged with data qualifiers that modify the usefulness of the individual values.

## 3.0 Data Validation of Pesticides and Polychlorinated Biphenyls

### 3.1 Custody, Preservation, Holding Times, and Completeness – Acceptable

All samples were extracted and analyzed within the required holding times. All samples were received intact and were properly preserved. The data package is complete and contains all the information necessary to recreate the sample results.

### 3.2 Initial Calibration and Performance Evaluation Checks – Acceptable

Initial calibrations and performance evaluation checks were analyzed at the required frequency and are correctly calculated. The QA2 linearity criteria ( $RSD \leq 20\%$  for pesticides and  $\leq 30\%$  for multicomponent analytes) and Functional Guidelines performance evaluation criteria were met.

### 3.3 Calibration Verifications – Acceptable with Discussion

Continue calibration verifications were analyzed at the required frequency and are correctly calculated. Except as noted below, the QA2 criteria of percent difference values less than or equal to 15% was met.

The percent difference values of tetrachlorometaxylene (TCMX) in the performance evaluation standards number 1 and 6 are above the QA2 criteria at 20% each. Data qualifiers are not required for surrogate compounds.

### 3.4 Blank Analyses – Acceptable

#### 3.4.1 Method Blanks

Method blanks were analyzed at the required frequency and target analytes were not detected above the reporting limit.

#### 3.4.2 Field Blanks

Sample SE050600MHB was identified as a field blank. Target analytes were not detected above the reporting limits.

### 3.5 Surrogate Analyses – Acceptable with Qualifications

Surrogate compounds were added to all samples, blanks and QC samples as required and are correctly calculated. Except as noted below, all percent recovery values are within laboratory's control limits.

The decachlorobiphenyl (DCBP) recovery in samples SE050600MHB 033, SE050600MHB 033 dilution, and SE050600MHB 034 are above the laboratory's control limits at 224%, 245%, and 140%, respectively. Data qualifiers are not required because the TCMX surrogate recovery values are acceptable.

The TCMX and DCBP recovery values in the diluted analysis of sample SE050600MHB 034 were reported as 210% and NR, respectively. Positive results were qualified as estimated (E) because the recovery of both surrogates on both columns is above the laboratory's control limits.

The DCBP and TCMX recovery values for the MS and the DCBP recovery value for the MSD analyses of sample SE050600MHB 034 are above the laboratory's control limits. Data qualifiers are not required for QC samples.

Sample ID	Analyte	Qualification	Quality Control Exceedance
SE050600MHB 034 Dilution	All	E positive results	Surrogate recovery above laboratory limits

### 3.6 Matrix Spike/Matrix Spike Duplicate Analyses – Acceptable with Discussion

Except as noted below, MS/MSD analyses were performed as required, are correctly calculated, and all percent recovery and RPD values are within the SAP criteria.

The laboratory did not analyze a MS/MSD pair with the water sample. Data qualifiers are not required since the water sample is a field QC sample.

The gamma-BHC recovery in the MS and MSD analyses of sample SE050600MHB 034 are above the SAP criteria at 314% and 336%, respectively. Data qualifiers are not required because the sample result, MS result, and MSD result are above the calibration range. Ideally, the laboratory should have reanalyzed the MS and MSD at a dilution.

### 3.7 Laboratory Control Sample Analysis – Acceptable

Laboratory control samples were analyzed as required and are correctly calculated. All percent recovery values are within the QA2 criteria of 50 to 150%.

### 3.8 Certified Reference Material Analyses

Certified reference material analyses are not required by the SAP and were not performed.

### 3.9 Compound Quantitation and Detection Limits – Acceptable with Qualifications

The final results are correctly calculated, including the amount extracted, percent moisture content, and dilution factors. The retention time criteria and percent difference between column results meet the requirements of Method 8081A (USEPA 1995).

The SAP target detection limits were met for all analytes, except when dilutions or interferences raise the reporting limit.

The validation chemist reviewed the chromatograms for multicomponent analytes, i.e., Aroclors. Due to the complex nature of the samples, the amount of non-target-analyte material present in the chromatograms, and the small size of the hard copy chromatograms, it is difficult to absolutely verify what, if any, Aroclor patterns are present in the samples. In the opinion of the validation chemist, the expertise of the laboratory staff and their ability to electronically manipulate the chromatograms (overlay, expand, etc.), should be relied upon for the determination of Aroclor results.

Samples SE050600MHB 033 and SE050600MHB 034 were diluted due to high levels of target compounds. In these instances the laboratory reported one analysis data sheet for the original analysis and one for each dilution. To condense the results to one result per analyte per sample, results that are above the calibration range (laboratory E flag) have been rejected (qualified R). Results and elevated detection limits from the diluted analyses that are not necessary have also been rejected (qualified R).

Sample ID	Analyte	Qualification	Quality Control Exceedance
SE050600MHB 033 SE050600MHB 034	All analytes flagged E by the laboratory	R	Results above the calibration range
SE050600MHB 033 Dilution SE050600MHB 034 Dilution	All analytes for which the dilution was not required	R	Elevated detection limit and unnecessary results

### 3.10 Field Duplicates

Field duplicates are not associated with this set of samples.